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Diphtheria Toxoid

A Review

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WITHOUT reviewing the history of toxoid or discussing the matter of priority in its use there is a romance behind its discovery or rediscovery which merits the retelling. In his laboratory in the Institut Pasteur Annexe at Garches, near St. Cloud, a suburb of Paris, Ramon had set up an Ehrlich test for the assay of diphtheria antitoxin. His V-shaped glasses with wide bases stood in rows on the marble table at which the Empress Eugénie once played at dairy-maid in the parkland at Villeneuve L'Etang, where later Pasteur pursued his work on rabies. The row of glasses contained toxin and varying dilutions of antitoxin ready to be injected into guinea pigs for the assay of potency of antitoxin. Ramon noticed a turbidity in certain of the mixtures. In spite of this disturbing occurrence he decided to inject the guinea pigs, one for each glass in the series. The test turned out exactly as anticipated in spite of the turbidity. Ramon found that the cloudy mixtures happened in the glasses which contained approximately balanced toxin and antitoxin at or near the point of neutrality. He thought that possibly the turbidity was due to a contamination, the cloudiness being a suspension of bacteria. The same series was again set up, this time with added formalin to control the possible contamination and to prevent the growth of bacteria. In spite of this precaution the cloudiness appeared in the same glasses as before. Again the series of mixtures of toxin and antitoxin was injected subcutaneously into guinea pigs. This time instead of some of them dying, others living as anticipated due to the under or over neutralization of toxin, none of the animals succumbed.

Here was a very important discovery—actually two discoveries. Ramon set out with feverish energy to explore them further; to interpret the cloudiness

at the point of neutrality and the non-toxicity of the under-neutralized toxic mixtures which should have killed the guinea pigs. In carefully controlled experiments he established that, under suitable conditions, a mixture of diphtheria toxin and antitoxin flocculated at and near the point of neutrality, and the mixture nearest this point was the first to show turbidity and later flocculation. This is the basis of the Ramon flocculation test used throughout the world for determining rapidly the potency of the diphtheria antitoxin in vitro. Similarly if the unitage of the antitoxin is known, the potency of toxin or toxoid may be measured at a great saving in animals and time. The baffling and unexpected effect of the formalin on the toxin was simultaneously investigated. He found that the toxin was considerably detoxified by the formalin so that in the above experiment the under-neutralized toxic mixtures which would normally have killed the guinea pigs now failed to do so. With a suitable amount of added formalin, diphtheria toxin left at incubator temperature became totally non-toxic but retained its antigenicity or immunizing power. This product Ramon called *anatoxine diphtérique*. After firmly establishing these two properties of anatoxine, non-toxicity and antigenicity, by animal experimentation, human beings were injected. This anatoxine or toxoid as it is usually called in English, proved to be a very satisfactory agent for active immunization.

Since the introduction of diphtheria toxoid (Anatoxine-Ramon) in France by Ramon of the Pasteur Institute in 1923 its application in the prevention of diphtheria has extended in varying degree throughout the world. It has been extensively used in North America and was first supplied and recommended in Canada by the Connaught Laboratories in 1925 to replace toxin-antitoxin mixture. In 1924, Dr. FitzGerald, Director of the Connaught Laboratories, visited the Pasteur Institute at Garches and was so impressed with the results of Ramon's work that he immediately cabled instructions to proceed with the preparation of toxoid with a view to supplying it for Canada as soon as preliminary studies had established its effectiveness. The total amount distributed since its introduction in this country has been sufficient for more than three million persons. During this time a wide experience has been gained in Canada in the use and usefulness of diphtheria toxoid.

It is the purpose of this communication to present a review, in the main of a non-technical nature, of certain phases of the use of toxoid in Canada. Some of the results of research given in this paper will appear in published form elsewhere. Bibliographical references are omitted since much of the data presented are recent and have not been published.

WHAT TOXOID IS

Diphtheria toxoid may for our purpose be described as diphtheria toxin to which an appropriate amount of formalin is added and kept at incubator temperature till it becomes non-toxic. The procedure is so controlled that the product must be non-toxic in 5 cc. amounts when injected into guinea pigs and it must be shown to retain its antigenicity; that is, its power to immunize experi-

mental animals. The basis of this measurable immunity is the diphtheria antitoxin produced in response to the toxoid injected. Standards of potency have been set by governmental authority to which the toxoid shall conform before distribution. Similarly the product is controlled in regard to non-toxicity and sterility. The potency of toxoid, and also of toxin, is not uncommonly expressed in terms of Lf units per cc., which is an expression of the combining power of the toxoid with antitoxin, determined by flocculation. Governmental standards may require of the manufacturer a certain minimum Lf unitage for toxoid intended for human use.

Diphtheria toxoid has been further modified within recent years by the addition of appropriate amounts of potassium alum. In this manner the toxoid is precipitated by the alum and after further treatment, the details of which need not concern us, this diphtheria prophylactic is known as alum-precipitated toxoid. Such a toxoid possesses increased antigenicity as compared with unmodified toxoid. The enhanced antigenicity of alum toxoid is stated to be due to the fact that, upon injection, it remains longer in the body. There may be other factors concerned.

Fundamentally the antigenicity of any toxoid preparation depends upon the initial potency of the toxin from which it is made. Improvements in diphtheria toxin production since its discovery by Roux in 1888 have been slow and intermittent and achieved mainly by trial and error. Research in diphtheria toxin has proceeded upon two main lines, namely attempts to increase the toxicity and Lf value, and to attain uniformity and thus to eliminate the wide variation in toxicity which is not uncommonly experienced from batch to batch. Thus diphtheria toxins have been produced in the Connaught Laboratories which have an Lf unitage of 125 per cc. This high value assumes practical importance if the contention be true that the higher the Lf the better the antigenicity. Uniformity of toxin may be realized when the factors of production are more clearly understood and the medium used for the growth of the diphtheria bacillus is composed of pure chemicals only, that is to say a "synthetic medium". This achievement seems at present to be near realization.

WHEN TO GIVE TOXOID

It is universally agreed that toxoid in order to control diphtheria effectively should be given to children during the pre-school period. The reasons for this are so evident and well-known that little comment is necessary. The death rate from diphtheria is highest in early childhood and half of all deaths from this disease occur among children of pre-school age. Further it is known that a high percentage of infants 6-12 months of age are susceptible to diphtheria. Maternally transmitted antitoxic immunity cannot, of course, be relied upon. Firstly, little over half of the mothers possess antitoxin with which to endow their new-born children. Thus of 292 mothers in Toronto in 1932, 38 per cent. had no antitoxin. Secondly, 70 per cent. of 53 infants born of mothers possessing antitoxin, and Schick negative at birth, became Schick positive by the ninth

month of life. All were Schick positive at the end of two years. It is advisable whenever possible to give toxoid during the first year of life. An added advantage of giving toxoid in infancy or in early childhood is the fact that reactions to toxoid are very rarely encountered among children of pre-school age. On the other hand, reactions are more likely to occur in older children and especially in adults. It is believed that the underlying causes of these reactions may, in the main, be ascribed to a sensitivity to diphtheria protein. This sensitivity is analagous to tuberculin sensitivity and is the result of infection. For example, there is some evidence to show that cases of clinical diphtheria, not skin-sensitive to an intradermal injection of diluted toxoid (reaction test) on admission to hospital, become skin-sensitive within approximately four weeks. "Reactors" or persons skin-sensitive to suitably diluted toxoid may be assumed to have had a "diphtheria experience" such as having been carriers or having had a so-called sub-clinical infection. This contention is supported by the fact that most (75 per cent.) reactors have an antitoxic immunity to diphtheria, which means that antitoxin is present in the blood. Epidemiological studies have also shown that the case rate in "reactors" is less by approximately 70 per cent. as compared with the rate in untested schoolmates.

TECHNIQUE OF ADMINISTERING TOXOID

Emphasis cannot be too strongly laid upon the necessity of strict aseptic technique in the administration of toxoid. A tragic accident recently occurred following the injection of toxoid. In a number of children abscesses developed due to infection with an haemolytic streptococcus. One child died, consequent upon the infection. The report of the laboratory investigations was to the effect that the infecting strain of streptococcus isolated from the abscesses of children from whom cultures were obtained was in each instance the same, namely the agglutinative type eleven of Griffith. Upon investigation it was found that individual, sterilized needles were not used for each child, the cotton used was from a previously opened package, the needles after boiling were picked up with the fingers and transported for convenience in the barrel of the syringe. While such inadequate technique might not regularly result in disaster, it is imperative that the most scrupulous technique be observed on all occasions. One must insist upon a separate needle for each child. Ideally both syringes and needles should be dry sterilized in the hot air oven (170°C. 30 minutes) or in the autoclave. Record type syringes will not withstand dry sterilization since solder is used in their construction; they will, however, withstand autoclaving or boiling. A common substitute for dry or steam sterilization, and for all practical purposes accepted as satisfactory, is the boiling of needles and syringes. Reliance upon rinsing with alcohol is unreservedly condemned. If an all-glass syringe is used in group immunization the plunger which is exposed when the syringe is full may become contaminated by coughing, sneezing or the like. It is, therefore, advisable to resterilize an all-glass syringe before refilling. The use of a record type of syringe with metal plunger obviates this inconvenience.

DOSAGE OF DIPHTHERIA TOXOID AND ANTITOXIN RESPONSE

During the past ten years and more, data in France, Canada, and other countries have shown that three doses of unmodified diphtheria toxoid, given at 3 weeks' interval, render 95 per cent., or more, of persons Schick negative. Gratifying though this excellent result is, it is of the greatest importance to determine whether under field conditions diphtheria is controlled or prevented by diphtheria toxoid. McKinnon and Ross have shown that the incidence of diphtheria among children given three doses of diphtheria toxoid (0.5, 0.5, 1 cc. at intervals of three weeks) and living in an environment in which diphtheria was very prevalent, was only 10 per cent. of the incidence of this disease among other children living in the same environment at the same time but not given toxoid. The reduction of 90 per cent. in incidence is a fair measure of the degree of protection afforded by diphtheria toxoid given as indicated above. In this same investigation it was shown that in the two-dose group the reduction was 76 per cent. These studies had to be laid aside for the very gratifying reason that diphtheria cases became too infrequent and thus rendered invalid any conclusion as to the incidence in the inoculated as compared with the uninoculated groups of children. In cities where immunization has been intensive and directed toward the pre-school child, clinical cases of diphtheria have been rare or have totally disappeared, as in Toronto, Hamilton, St. Catharines, and Brantford.

During the last ten years parallel studies have been undertaken to show the response in human beings to various toxoid preparations variously used. Such studies, although of relatively minor importance as compared to long continued epidemiological investigations, do nevertheless throw light upon the question of choice of antigen and the most effective dosage to use. One dose of unmodified diphtheria toxoid has never been suggested as an effective means of immunization. What figures that are available suggest that approximately 20 per cent. are rendered Schick negative. Two doses, for a short time used in Canada and much more extensively used in the United States, are much more effective. Approximately 60 to 70 per cent. become Schick negative when the interval between doses is three weeks, which result is in agreement with the reduction reported by McKinnon and Ross cited above. It is clear then that the number of doses, and as will be seen later the spacing of them, is one factor in the effectiveness of toxoid. For the comparative study of diphtheria antigens the Schick test is, however, inadequate since the test is in essence qualitative and not quantitative. What one wishes to determine is the response in diphtheria antitoxin to the particular antigen used in a particular way. This entails the titration of antitoxin in the serum of children before giving toxoid and at intervals thereafter, which is a procedure demanding co-operation, patience, technical skill, and time. Only persons having no diphtheria antitoxin initially are suitable since any specific stimulus, even the minute amount contained in a Schick test dose, will cause a rise in antitoxin titre in persons who have detectable (1/1000 unit per cc. of serum) amounts of antitoxin. In 1934

studies were undertaken to establish the average antitoxin response in children to three doses of average strength (15-20 Lf) diphtheria toxoid. In this way a standard of comparison or yard-stick was established to serve as a basis of comparison for the antitoxin response to other diphtheria antigens or other dosages. At the same time it was planned to obtain blood samples at intervals from this group of children over a period of years to determine the rate of fall of the antitoxin and thus throw light upon the question of duration of immunity. These studies can be carried on only in a non-diphtheria environment since naturally acquired infection with the diphtheria bacillus, if frequent among individual children in the group, would cause a rise in antitoxin titre in those so infected and thus invalidate the results obtained by assessing the antitoxin at given intervals of time. Fortunately cases of diphtheria have been rare in Toronto during the period of study, and similarly surveys among school children have shown an extremely low incidence of carriers. Thus of 12,560 cultures from school children examined between the years 1934 to 1939 only 5 virulent diphtheria cultures were isolated, which is a rate of 0.04 per cent. At the time of initiating these studies it was unfortunately not possible in the group of children available to obtain an initial blood sample, which was, however, regularly obtained in groups subsequently studied. Consequently the children included in the first study were selected on a basis of the Schick test. Only Schick positive children were chosen for the experiment. Since Schick positive children rarely (possibly 10 per cent.) have any detectable antitoxin and since the test itself does not cause a rise in antitoxin in such children, the limitations imposed upon the adequacy of this "three dose yard-stick" would seem not very great. At any rate certain tentative deductions can be drawn from the studies, despite the fact that the group of children chosen is not an ideal one.

TABLE I

ANTITOXIN RESPONSE IN CHILDREN TO DIPHTHERIA TOXOIDS

3 months after toxoid	No. tested	Per cent. distribution		
		1/250 unit and greater	1/50 unit and greater	1/10 unit and greater
3 doses (15-20 Lf)	108*	99	94	76
2 doses 75 Lf	142	73	55	26
2 doses 50 Lf	105	70	45	25
2 doses 20 Lf	48	60	27	5
1 dose alum	82	88	59	11
2 doses alum	181	96	84	48

**Initially Schick positive; all other groups in table initially without antitoxin (less than 1/1000 unit).*

It is clear from reference to table I that toxoid of even very high potency (75 Lf) when given in two doses of 1 cc. each at 3 weeks' interval is not nearly so effective as three doses of 0.5, 0.5, and 1 cc. with a similar interval. It is apparent that the antitoxin response to one dose of alum-precipitated toxoid does not approach that resulting from three doses of unmodified toxoid. The response, however, to one dose of alum toxoid compares favourably with two doses of very high Lf toxoid. The figures shown in the table suggest that

there is little to choose between the results obtained with two doses of alum toxoid and three doses of unmodified toxoid. A comparison of the results obtained with toxoid of different Lf, namely 75, 50, 20, suggests that the Lf bears a relationship to antitoxin response. It would seem that the higher the Lf the better the response. However, the difference in degree of response is not great as compared with the difference in Lf. It seems clear from these studies and others not alluded to here that, given a reasonably good toxoid, the chief factors concerned in the degree of antitoxin response are repetition of doses and interval between doses; the more doses and the longer the interval between them the better the antitoxin response.

It must not be assumed that one can substitute arithmetic for immunity but at least the figures express in some measure the relative effectiveness of diphtheria antigens in calling forth antitoxin in children. Nor must it be assumed that laboratory studies of this sort are final in settling the matter of the choice of antigen. The most that one may expect is to point the way. What everyone is interested in is the safety and the effectiveness of a diphtheria antigen in preventing diphtheria. Only the most careful field studies carried on over a long period of time will give the answer. Instead of worrying about the choice of diphtheria antigens we should thank God that we have an effective means of preventing diphtheria and get on with the matter of immunization.

CHOICE OF ANTIGEN

The question will naturally arise, especially in the mind of the administrator, why not use two doses of alum toxoid in place of three doses of unmodified toxoid. At the present time two doses of alum toxoid are being used extensively in the United States. In Canada controlled groups of children have been similarly inoculated with favourable results in Winnipeg, Montreal, and Toronto. However, because of the very gratifying experience in Canada with unmodified toxoid for the past ten years, one is loath to make a change unless every vestige of uncertainty is satisfied. Alum toxoid is more likely to produce abscesses. In general the more alum per dose of toxoid the more chance there is of abscess formation. With better methods of preparation of alum toxoid this distinct disadvantage has been minimized and is apparently being overcome. The minimum effective amount of alum remains to be determined. Another consideration is the possibility of obtaining undesirable reactions of an anaphylactic nature when reinforcing the immunity by a subsequent dose. Alum toxoid is very effective in rendering guinea pigs sensitive and anaphylactic. For this reason the giving of a second or subsequent dose of alum-precipitated toxoid at long and irregular intervals may increase the danger of the occurrence of such reactions in man. Only prolonged experience will give a practical and satisfactory answer to this theoretical objection to alum toxoid.

DURATION OF IMMUNITY AND REINFORCEMENT OF IMMUNITY

It is important to appreciate that the level of antitoxin produced in response to toxoid diminishes over a period of time. For example, of more than

200 children, initially Schick positive and given three doses of toxoid, all* have shown some loss of antitoxin by the fourth year. Blood samples have been obtained at intervals during this period and from the results of antitoxin titration it is evident that some individuals lose antitoxin more rapidly than do others. One of the assessible factors of protection against diphtheria is the antitoxin in the circulating blood, whether this be injected foreign (horse) antitoxin as in passive immunity or natural antitoxin as in active immunity. It follows then that presumably when the antitoxin falls below a certain level protection can no longer be relied upon. What this level is can perhaps not be stated with certainty. There is some evidence, however, that this critical level is in the neighbourhood of 1/100 unit per cc. of blood serum. Possibly the Schick level, namely 1/250 unit, is sufficient for protection. Probably this point will vary under varying conditions, exposure, dosage of infecting bacilli and so on. One might reasonably believe that the higher the initial level of antitoxin after toxoid has been given, the longer it will take before it would drop to this critical level, where protection is gone or uncertain. This is, in fact, the case in the vast majority of the individuals followed in a series of 244 children bled at intervals after three doses of toxoid. Expressed as a loss per cent., the diminution of antitoxin in the group as a whole is very striking. The average unitage for the group, namely 0.3 units, three to six months after three doses, drops in successive years by 33, 65, 75 and 78 per cent. Because of the initially high level (0.3 units), the loss of 78 per cent. of this leaves the level, after four years, still in excess of 1/20 unit. The initial level of antitoxin after a course of toxoid should be at least 1/50 unit so that there may be a reasonable expectation of protection (1/250 unit) for four years. Similarly if the protective level is assumed to be 1/100 unit the initial antitoxin must be of the order of 1/20 unit. However satisfactory this high average of 0.3 units appears, when the group is considered, it is not nearly so satisfactory when applied to the individual. For example, in the above group of children after three doses of toxoid (0.5, 0.5, 1.0 cc. at three weeks' interval) 9 per cent. had less than 1/250 unit, 19 per cent. less than 1/100 unit and 21 per cent. less than 1/50 unit. The fact that artificially immunized persons lose antitoxin in the manner illustrated above emphasizes the desirability of using the best antigen in the most effective way possible in order that the initial level of antitoxin after immunization be high. There are no short cuts, the best antigen is not too good when the protection of children against diphtheria is at stake. In a group of 552 children from Hamilton, St. Catharines and Toronto, given three doses of toxoid five years previously, 8 per cent. had less than 1/250 unit, 18 per cent. less than 1/100 unit and 28 per cent. less than 1/50. These children were not known to be Schick positive at the time of immunization and some (possibly 10-15 per cent.) may have been immune before toxoid was administered. It is evident from the result of these studies that within four or five years a not inconsiderable number of

**There were five children who showed a marked rise in antitoxin, two in each of two families and one other. This rise was presumably due to a diphtheria experience, possibly a carrier state. No history of additional toxoid injections in these children was obtainable.*

children require reimmunization or perhaps better expressed, reinforcement of their immunity. Fortunately this can be readily and very effectively accomplished. Thus of 50 children whose level of antitoxin had dropped to less than 1/50 unit, all responded to the subcutaneous injection of 0.1 cc. of toxoid. In every instance the level rose to more than 1/20 unit and in 98 per cent. of the children to more than 1/5 unit within 1 month. Eight of these children had no detectable antitoxin (less than 1/1000 unit) at the time of the "secondary" stimulus. Dr. Alan Young of the Department of Public Health, Toronto, found that of 750 school children who were found in an extensive survey to be Schick positive some years after three doses of toxoid, 99 per cent. became Schick negative within one month after a single dose of toxoid (¼ to 1 cc.). Since reinforcement of immunity by a subsequent dose of toxoid (*dose de rappel*, of Ramon) is so effective there seems every reason that both private physicians and health department administrators should subscribe to the maxim "immunize and keep immune". It may be confidently stated that infants given toxoid under one year of age should be given a subsequent "reinforcing dose" at least once before entering school at the age of five. This reinforcing dose may be 0.1 cc. to 1 cc. given subcutaneously. The advantage of the small dose is that a reaction test is not required before administration of toxoid. In young children, full doses of 1 cc. may be given.

THE SCHICK TEST

It is the individual duty of a physician in private practice to accept the responsibility that children under his care are immune to diphtheria in so far as this is practicable. Immunity may, for clinical purposes, be determined by the Schick test with control, carried out one month after the last dose of toxoid, and subsequently every year or two during pre-school life. The minute amount of toxin in the test and of toxoid in the control injection acts as a secondary stimulus in persons previously given toxoid and thus raises the antitoxin level. This may, however, be more effectively and more conveniently accomplished by giving a subcutaneous injection of toxoid as has been discussed above. In community immunization of pre-school children, the Schick test has no place except in special surveys since it is costly and time consuming. If a small dose of toxoid were substituted for a Schick test following the giving of toxoid more effective immunization would result with a saving of time and money. Before toxoid is administered to adults such as physicians, nurses, hospital attendants, nurse-maids and teachers a Schick test with control should be carried out. Only the Schick positive persons require toxoid. If it is desired to inoculate "reactors" it is advisable to use diluted toxoid, specially prepared for this purpose.

ACTIVE IMMUNIZATION SCHEDULE

The tried and proved means of prevention of disease by specific measures, to be most effective, should be instituted early in life. The following schedule, in the light of our present knowledge, can be confidently suggested.

At 3- 6 months—Small-pox Vaccine.
6- 8 months—Whooping-Cough Vaccine.
9-12 months—Diphtheria Toxoid.
18 months—One dose of Whooping-Cough Vaccine (reinforcing).
1- 2 years—Scarlet Fever Toxin.
2- 4 years—One dose of Diphtheria Toxoid* (reinforcing).
5-10 years—Small-pox Vaccine (reinforcing).

One might add two additional procedures, namely, immunization against tetanus and against typhoid fever. These are very distinctly of lesser importance as a public health measure in Canada. An additional reinforcing dose of tetanus toxoid must be given as soon as possible after a wound from which tetanus infection is suspected. The available data show that the response to this injection, in the vast majority of instances, results in antitoxin production of an adequate degree within the usual incubation period of the disease.

**If alum toxoid has been previously used the reinforcing dose should be alum toxoid and not unmodified toxoid, since the former is more slowly absorbed and thus minimizing the chance of occasioning an anaphylactic reaction.*

The Program of Medical Care in Manitoba*

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NO matter how much we like to think of democracy as the state composed of individuals, I am sure we all agree that under the present set-up in our social system the security of the individual is becoming of paramount importance to the state. It is only natural, therefore, to find that in our society the state is now taking an ever-increasing part in the provision, for the individual, of those things which will make his life a happier one.

We find that the state now provides free treatment for tuberculosis, for mental conditions, and for venereal disease. The state provides, in various ways, medical treatment for the unemployed or for other persons unable to pay. The state, through local governing bodies, makes provision for hospital expenses for individuals who cannot pay out of their own resources. Besides all this the state has also set up a health department for the prevention of disease and preservation of health, which includes inspection of water and food supplies, supervision of the production of milk, the provision of public health nurses, travelling clinics and in some cases dental treatment; but after all this is done the fact remains that many people are in a sad plight when illness strikes. Actually a severe illness is a family and community catastrophe of major importance. In order to try to prevent such undesirable situations many organizations in Western Canada have gone on record as favouring some form of state medicine or health insurance. Other organizations have appointed committees to make a study of state medicine and all its implications, and in some of the provinces legislation has been placed on the statute books providing for the inauguration of schemes of health insurance. The humanitarianism behind such plans constitutes a powerful appeal to the imagination, and this is one of the factors which sways large groups to make an insistent demand for social reform of this character.

In Manitoba, at the present time, the distribution of our population is such that adequate provision of medical care to some groups presents a great difficulty. As is to be expected, the amount of medical services available, under the present system of supplying medical care, varies in the different communities. In Greater Winnipeg, where approximately two-fifths of the total population of the province resides, there is one physician to every 900 residents; in the cities

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of Brandon and Portage la Prairie there is one medical man to every approximately 1000 persons; in the organized rural communities there is one to every approximately 2000 persons; while in unorganized territory, many parts of which are quite thickly settled, there is only one doctor to every 9000 persons.

It is quite natural, of course, that members of the profession should like to practise in communities where all facilities for the treatment of disease are available, and where living conditions are such as to make life enjoyable. Despite this fact, however, in not a few instances, members of the profession have gone into our less fortunate communities and are rendering a service to the people in these districts which cannot be estimated in dollars. However, the fact remains that in a considerable portion of rural Manitoba, and certainly in practically all unorganized territory, little if any service is available to the people, and what service is available costs so much that the ordinary individual cannot afford to take advantage of it.

In unorganized territory, where the situation is most acute, it has been found necessary not only to establish nursing stations—of which there are five—but also to cover the whole of these districts with our public health nursing service. In some of the areas provided with this service, where there are no medical facilities available, the nurse does what we call "public service nursing"; in other words visits the home, takes care of all sickness of a minor nature (including where necessary the attendance at confinements), and advises the people as to the requirements in any given case of medical attention or hospital care. We believe this has proved a boon to these particular districts in Manitoba, and that the number of nurses employed in this service should be increased so that the territory they serve may be made small enough to let them do more intensive work. Altogether one would be safe in saying that the services rendered in connection with tuberculosis, mental disease, care of unemployed persons, municipal doctors, etc., would include one-fifth to one-fourth of the total population which are receiving medical care at the expense of the state.

With the advent of the depression, the profession in our province soon found that the amount of charity work became so great it was not possible for them to take care of it, together with the work for which they were receiving payment, and make an adequate living. The first attempt to make some arrangement for the medical care of the unemployed was made in Winnipeg, where in 1933 the profession decided that some arrangement would have to be made for the provision of medical care to the unemployed.

After nearly a year of negotiations with the city, an arrangement was entered into which set up a system of medical services to the unemployed, under medical control, with a special schedule of fees of approximately one-third to one-half the rates usually charged. This arrangement still continues. The service supplies everything that might be required by the unemployed person, including drugs and some dentistry. The individual needing the service has a choice of physicians but, except in case of emergency, is required to get authority from the medical relief officer to call his doctor. The physician, on taking over a case, has to notify the medical relief officer. Notification is made on a special

form which gives information in reference to the type of the illness as well as to the amount of medical care such illness may require. The service is not claimed to be a complete one, for it is supposed to take care only of acute and sub-acute conditions. However, it has developed until practically everything from which the unemployed person may be suffering is looked after by the profession at the expense of the city. The service is under complete medical control through a medical advisory committee who have authority to settle all disputes which may arise in connection with the service. This committee consists of the city medical officer of health, the city relief medical officer, the chairman of the Committee on Sociology of the Manitoba Medical Association and one other member of that association. This service has extended until now practically all municipalities in Manitoba give their unemployed the same type of medical care—under the same plan—the payment being made, on a fee basis, to the physician for all work done, using a special schedule of fees.

The information obtained from the returns of the physicians under the plan in operation in Winnipeg has been tabulated from year to year, and we are now obtaining statistics which will be of real value in estimating, for an urban community, the amount and type of illness and its requirements in terms of medical care. Certain of these data are presented in tables I, II, III, and IV.

TABLE I

PRINCIPAL CAUSES OF ILLNESS
MEDICAL SERVICES TO UNEMPLOYED, WINNIPEG, 1935-37
Cases per 1,000 persons

Digestive system	61.5
Tonsillitis and sore throat	52.7
Respiratory diseases	52.5
Diseases of skin	30.7
Confinements and other puerperal conditions	29.7
Accidents and other external causes	28.9
Heart and other circulatory diseases	22.8
Disease of nervous system	19.5
Non-venereal diseases of genito-urinary system	18.4
Lumbago, arthritis, and rheumatism	16.9
Measles	16.5
Diseases of ear and mastoid process	13.0
Diseases of kidney and adnexa	10.7
Diseases of eyes	6.0
Pneumonia	5.9
Diphtheria, scarlet fever, and typhoid	3.4
Tuberculosis, all forms	2.1

TABLE II

MATERNITY SERVICES TO UNEMPLOYED IN CITY OF WINNIPEG (1935-1937)

1. Average number of pregnancies per annum

Pregnancies	Hospital	Home	Total	Abortion (per cent.)
Full term	583	60	643	26.4
Abortions	71	99	170	....
Total	..	..	813	20.9

2. Birth rate per 1,000 population

Relief 20.2 City 12.4

Note.—All abortions received medical care and were thus reported. Percentage of abortions is new in statistics and may give us some idea of the abortion situation.

TABLE III

MEDICAL SERVICE TO UNEMPLOYED IN CITY OF WINNIPEG (1935-1937)

1.	Average number on relief	30,531
2.	Number of illnesses:	
	Total yearly average illnesses	22,131
	Average illness per person per year	0.75
3.	Days of hospitalization (1935 and 1937 only):	
	Average per person	1.14
4.	Death rate per 100 population (1936 and 1937 only):	

	Specific death rate of relief population	Specific death rate for city of Winnipeg
Age groups 1-60.		
Adjusted rate	2.47	3.10

Note.—In considering "death rate" we deleted age 0-1, as we understand that no deaths of infants in hospitals following maternity cases were credited as relief deaths. Relief rate in this age group was only half of the Winnipeg rate. It must be remembered also that the relief groups are not exposed to industrial hazards.

TABLE IV

MEDICAL SERVICES TO UNEMPLOYED, WINNIPEG, 1937
COST OF SERVICES RENDERED
(Special reduced schedule of fees)

Average number of persons on relief	27,875
Average number of illnesses per person	0.92
Average cost per person for doctors' fees (gross)	$4.20
Average cost per person for hospital services	$3.53
Total average cost per person (including special services paid and unpaid)	$7.73

In Alberta a very interesting scheme of health insurance has been in operation for a period of some five years. Back in 1934 the five doctors living in the town of Stettler, which is in a thriving community with an adequately equipped hospital and supported by a well-settled farming district, discovered that although they were doing a tremendous amount of medical work, they were not collecting enough money to make both ends meet. After considerable discussion, they decided to institute a scheme of health insurance whereby the head of a family would pay, in advance, the sum of $25.00 a year, insuring for himself, and all the members of his family, medical attention in case of illness or injury. This medical service was a complete one, with the possible exception of the more technical type of specialist service. The scheme proved to be very popular with the local people, as nearly all who could obtain the $25.00 joined. The money collected by the doctors was put into a common fund and at the end of the year was distributed *pro rata* to the physicians, depending upon the amount and type of service rendered.

In speaking to one of the doctors a few months ago I was informed that although in the beginning this was a voluntary system of health insurance, the local municipalities in this district are now asking that it be made compulsory in order that every resident in the district will be entitled to the same type of service. The doctors have agreed amongst themselves, if the scheme is made compulsory, that they will be prepared to provide the service for the sum of $15.00 per family, per year. This does not, of course, include drugs or hospitalization.

As yet there are no figures available from this experiment to indicate the type and amount of professional services required, although the doctors say that for the first two years they were probably overworked, but now that all the chronic conditions have been attended to, the types of illness they now take care of are those of a minor nature. As one doctor says—"It is very seldom indeed that we now have to make a trip to the country to see a sick individual, as the individual comes in to the doctor, or hospital, before he becomes so ill he cannot travel." It would seem that this type of practice might be extended considerably and should fill the real need where a group of doctors can work together. Under this plan the patient has choice of doctor and can change his physician only at the end of the year, or with the consent of both the new and old physician.

THE "MUNICIPAL DOCTOR" PLAN

In two western provinces, namely Saskatchewan and Manitoba, local communities have, over a period of twenty years, experimented with various schemes in an attempt to solve their own difficulties. This applied particularly to those communities in which very little, if any, medical care was available. From these attempts on the part of local districts to make provision for medical care, a scheme which is now known as the municipal doctor scheme has evolved. This has so far progressed that we find in Saskatchewan approximately one-fifth of all the rural municipalities have a general practitioner's service supplied in this way; while in Manitoba there are twelve municipalities now receiving medical care under this plan, with the likelihood of some six or seven more operating during the coming year.

As the name of the scheme implies, a physician is engaged by a municipality on the salary basis, to give to the residents of that municipality medical care: such care to be any that may be given in the patient's own home, or in the doctor's office. A municipality in Western Canada is a local unit of government and has an area consisting of from 200 to 300 square miles, with a population varying from 1,200 to 3,000.

The municipal doctor plan of supplying medical service is now well stabilized in Manitoba, in that we have adequate legislation to control it and this control rests directly where we believe it belongs; i.e., with the medical group in our governmental organization, the Provincial Department of Health and Public Welfare.

Control is exercised over the formation, size and population of the proposed municipal doctor's area, the doctor's salary, and the terms of his contract. A standard contract, which remains in force for the duration of the Municipal Doctor By-Law, is now in operation and makes certain provisions which we think are essential if the public and the practitioner are to receive proper consideration. It sets out in detail the duties of the doctor. The contract also makes provision for leave for the physician each year, with pay, and an increased leave every second year, with pay, in order that he may go for short post-graduate courses. Provision is also made for permission to attend all district

and provincial medical association meetings without loss of salary. In this way we hope to keep up-to-date those physicians who find this type of work attractive.

In order that the doctor may not be at the mercy of a lay governing body, provision is made in the contract that he cannot be discharged without three months' notice, and if he is of the opinion he is being discharged without cause he has a right to appeal to an advisory board, consisting of three members—one representing organized medicine, one representing the Department of Municipal Affairs, and a third chosen by these two. The decision of this board is final and binding on both parties.

From a public health standpoint, a municipal physician makes an ideal health officer, because he finds it to his advantage to use, to the fullest extent, those methods now available for the prevention of disease. In these municipalities there is complete immunization against diphtheria and smallpox and, in most of these areas, also against scarlet and typhoid fevers.

The municipal doctor usually provides a fairly adequate school medical service. Prenatal care of expectant mothers is well looked after. There being no financial barrier between the mother and the physician, she seeks advice and any medical care early in pregnancy.

STUDY OF MORBIDITY IN MANITOBA

We have felt in Manitoba, for the past year or two, that the statistics we are getting from the supplying of medical care to the unemployed, in reference to the amount and type of illness in the urban communities, are such as would enable us to attempt to set up a scheme of health insurance for an urban population, if and when the public should demand it. However, our information in reference to the requirements of our rural population is entirely inadequate if we should be requested to establish any scheme to embrace the whole of the province. Looking for ways and means of getting such statistics, it was decided that we might take the municipal doctor areas already established and try to gather from them the actual amount of medical care being given to the residents of the districts served.

Through the co-operation of the Rockefeller Foundation, the Department of Pensions and National Health, Ottawa, organized medicine, and our own Provincial Health Department, a morbidity study in rural areas was started on May 1, 1938, and will be carried on for a period of at least two years, and we hope possibly five. Information is being obtained from nine municipal corporations, served by seven municipal doctors. This group from which the morbidity statistics are being obtained consists of approximately 15,000 people, and we think it is representative of the rural population of Manitoba in that it contains various nationalities on farms, in small hamlets, and in villages, in various stages of economic well-being. There being no financial barrier, from the standpoint of a general practitioner service, between the patient and the doctor, we believe that we should obtain an accurate record of every illness or injury which requires medical attention.

This study has now completed its first year's operation. Some of the provisional statistics obtained are presented in tables V to X.

TABLE V—RECORD CARD (Punch Card)
Medical Services for Unemployed in Winnipeg

Case No.	Patient's Name	P.O. Address	Municipality ——Qr.——Sec.——Twp.——Rge.——
Month	ETIOLOGY X. Communicable O. Infection 1. Degenerative 2. Functional 3. Congenital 4. New Growth 5. Poison 6. Pregnancy 7. Nutritional 8. Traumatic 9. Others	SERVICE RENDERED 1. Medical 2. Surgical 3. Fractures 4. Obstetrical 5. Special TYPE OF SERVICE 1. Major 2. Minor 3. Post—(op., partum) 4. Pre-natal 5. Abortion 6. Confinement (m) 7. Confinement (f) 8. Consultation 9. Anaesthetic	CALLS — Encircle Dates of Calls OFFICE: 1 2 3 4 5 6 7 8 9 10 11 12 / 13 14 15 16 17 18 19 20 21 22 / 23 24 25 26 27 28 29 30 31 HOUSE: 1 2 3 4 5 6 7 8 9 10 11 12 / 13 14 15 16 17 18 19 20 21 22 / 23 24 25 26 27 28 29 30 31 HOSPITAL: 1 2 3 4 5 6 7 8 9 10 11 12 / 13 14 15 16 17 18 19 20 21 22 / 23 24 25 26 27 28 29 30 31
Sex M. F.			PRIMARY DIAGNOSIS
Age—in years			Complications, and/or Secondary Diagnosis
Nationality			Days absent from occupation
1. Single 2. Married 3. Widowed		SPECIAL SERVICES 1. X-Ray 2. Cystoscopy 3. Laboratory 4. B.M.R. 5. Refraction 6. Optical 7. Dental 8. Special Trtmt. 9. Special Exam.	Doctor's Signature
0. Cont'd from Month of 1. Cont'd to 2. Referred 3. Ended-Recov. 4. Ended-Died	LOCATION 01. Skin 02. Head and Neck 03. Eye 04. Ear 05. Nose 06. Throat 07. Glands (neck) 08. Endocrines 09. Neurological 10. Respiratory 11. Cardio. Vasc. Bl. 12. Gastro-Intest. 13. G.-U. 14. Gyn. Obs. Breast 15. Musculature 16. Extremity-Bone 17. General		Consultant's Signature
Date Case End.		Code I. 1	USE REVERSE SIDE FOR REMARKS
1. Acute 2. Chronic			
1. Emergency 2. No.			
Name of Hospital			
Date admitted		Code II. 2	
No. Days in Hosp.	Mileage		

TABLE VI

MORBIDITY STUDY, MUNICIPAL DOCTOR AREAS, MANITOBA
May 1, 1938—April 30, 1939
ILLNESSES REPORTED AND TREATED IN AREAS

Sex	Medical	Surgical	Fractures	Childbirth and puerperal state	Special	Total Cases
Male	3,094	725	61	...	205	4,085
Female	2,996	450	18	232	142	3,838
Total	6,090	1,175	79	232	347	7,923

Average illness per resident—.52.

TABLE VII

MORBIDITY STUDY, MUNICIPAL DOCTOR AREAS, MANITOBA
May 1, 1938—April 30, 1939
SERVICES RENDERED BY MUNICIPAL PHYSICIANS

Number of office calls	9,728
Number of house calls	3,880
Number of hospital calls	877
Special services (x-ray, laboratory, refractions, dental, etc.)	899
Total miles travelled by municipal physicians	36,010

TABLE VIII

MORBIDITY STUDY, MUNICIPAL DOCTOR AREAS, MANITOBA
May 1, 1938—April 30, 1939
HOSPITALIZATION AND DISABILITY

Hospitalization:	
Number of patients admitted to and discharged from hospital	565
Number of hospital days	6,793
Average days per patient	12
Disability:	
Total days of total disability (persons six years old and over)	23,032
Average days per case of illness	2.9
Average days per resident	1.5

TABLE IX

MORBIDITY STUDY, MUNICIPAL DOCTOR AREAS, MANITOBA
May 1, 1938—April 30, 1939
HEALTH SERVICES RENDERED

Vaccinations	2,455
Diphtheria toxoid immunizations	1,953
Scarlet fever immunizations	350
School examinations	1,263

TABLE X

MORBIDITY STUDY, MUNICIPAL DOCTOR AREAS, MANITOBA
May 1, 1938—April 30, 1939
COST OF SERVICES RENDERED
(Special Services and Hospitalization provisional figures)

	Amount	*Per cent. of total*
General practitioners' services	$26,250.00	40.3
Specialists' services	20,960.00	32.1
Special services (x-ray, laboratory, refractions, dental, etc.)	1,703.00	2.6
Hospitalization (exclusive of sanatoria levy)	16,303.00	25.0
	$65,216.00	100%
COST PER PERSON (15,058 persons) per year		$4.33
MONEY EXPENDED BY MUNICIPALITIES AND PROVINCE for public health services exclusive of medical care (cancer, tuberculosis, biologics, etc.)		$10,047.84
COST PER PERSON PER YEAR		.67

STATE PROVISION OF MEDICAL CARE

I cannot conclude these remarks without making some very definite statements in respect to the whole question of state provision of medical care. Although people may demand such a service, it will be no easy task to ensure that it is likely to be anywhere near 100 per cent. satisfactory. The following questions raise matters which must receive very careful consideration in the supplying of adequate and up-to-date medical care for our people:

1. Is the present training of medical students such that the various types of service required by the population can be adequately provided at the price which they can afford to pay?

2. Is it not possible that if a service is provided free to our population the total cost of such service is going to be immediately tremendously increased and the burden become such that the taxpayer will be unable to meet the cost?

3. Will not demands be made upon doctors by patients, when there is no financial barrier between patient and doctor, that the patient receive a great deal of medical care which probably is not required and possibly might be injurious to him?

4. If a doctor is paid on a salary basis, what must we do to see that he is going to keep himself what might be called "medically fit"?

However, despite these drawbacks, I am fully convinced that the time is quickly coming when public demand will compel public officials to provide some such service, and whether we as the medical profession like it or not, we will, in our desire to protect the public, be forced to co-operate in setting up a scheme or schemes. It would seem to be that, among other things, we should insist, firstly, that the medical part of any such schemes must be under direct medical control, either through the medical personnel directly connected with the official health services of the state or province, or through organized medicine, or through the combination of both. Secondly, I personally do not think that sick benefits, which we find tacked on to almost all systems of state provision of medical care, should be the concern of the profession. In my opinion, certification for sick benefits puts a responsibility on the medical man which is bound to have an effect on him as a practitioner, and also on his integrity as a citizen. And lastly, we as the medical group in our governmental set-up must insure that any scheme for the state provision of medical care be wholly interlocked with the organized efforts of public health departments so that all those in the practice of medicine will continue to stress to an ever-increasing extent those aspects of medicine which have as their ultimate goal prevention of disease and preservation of health.

Scarlet Fever Immunization in Edmonton, Alberta*

G. M. LITTLE, M.D., D.P.H.
Medical Officer of Health, Edmonton

IT falls to the lot of the medical health officer to evaluate the available preventive measures against disease, and to institute in his own community such of these measures as may be useful and practicable.

To arrive at a decision as to what he will do about scarlet fever immunization is no easy task. The effort to bring to large groups of children a procedure which entails five inoculations and at least one Dick test is a formidable and costly undertaking, to say nothing of the inconvenience to parents necessitated by repeated visits to a clinic centre with pre-school children, and to the schools from such frequent interference with study periods.

In short, is expenditure of the time, money and effort, and the inconvenience involved, justified by the reduction in the incidence of scarlet fever in the immunized group?

This question does not yet seem to be satisfactorily answered in the minds of many physicians, because the use of scarlet fever toxin for immunization is still not widely advocated as is diphtheria toxoid and smallpox vaccine.

Numbers of reports appear indicating considerable success in immunization against scarlet fever, but these results show wide variation.

One reason for this would seem to be the marked variation in the amounts of antigen used in different groups immunized. Dick and Dick, in their recently published useful volume "Scarlet Fever", state that the large immunizing doses of toxin as recommended by them will immunize 95 per cent. of susceptible persons. I believe that many who have observed the not infrequent more or less severe reactions occurring with the use of a much more conservative dosage are diffident about administering to large numbers of children a dosage totalling over 140 thousand skin-test doses. The health officer well knows that frequent severe reactions may greatly retard the introduction of such measures to his people.

That 95 per cent. protection can be obtained in this way, however, indicates how closely these workers have approached to a satisfactory solution of this problem. It remains to develop an effective antigen requiring fewer doses and giving less reaction, to place the prevention of scarlet fever on the same comfortable basis as is that for diphtheria.

In the meantime the local health authority must proceed in the light of his own experience and the available results reported by others. It occurs to me that a periodic gathering, summarizing, and transmission of such information to

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the profession would be an appropriate and valuable undertaking for the Department of Pensions and National Health of the Federal Government.

During the 1936-37 school term, 6982 of the 15,045 public school children in the city of Edmonton were each given five doses of scarlet fever toxin by Dr. R. B. Jenkins, then health officer of the city. The remaining 8063 children have no record of immunization. The toxin used was that distributed by the Connaught Laboratories for active immunization, the five inoculations totalling 18,630 skin test doses.

Previous to inoculation a sample of 500 school children were given the Dick test. As over 90 per cent. of these were positive, the test was discontinued.

On February 28, 1939, our records showed 447 of the 15,045 school children as having had scarlet fever, these cases being distributed as follows:

	No. in Group	*Cases*	*Rate per 1000*
Immunized	6982	29	4.1
Non-immunized	8063	418	51.8

It is obvious that the case rate of the non-immunized children was more than twelve times that of the immunized. Had the case rate of the non-immunized children applied to the immunized group, we should have expected 361 cases of scarlet fever in this group instead of the 29 cases reported.

In short, it seems reasonable to assume that immunization prevented the occurrence of 332 cases of scarlet fever in the group of 6982 immunized children over a period of approximately two years.

Those who ponder the number of serious complications likely to develop in 332 children having scarlet fever, to say nothing of the time and cost incident to quarantine and treatment, will probably conclude that our present immunization against this disease, despite its being cumbersome and costly, is well worth carrying out if within the compass of their budget.

Its present status, however, suggests the need for continued gathering of statistics regarding groups immunized against scarlet fever, so that the value of this measure may be conclusively settled to the satisfaction of the profession and of the people generally.

DISCUSSION

G. MURRAY FRASER, M.D.
Medical Officer of Health, Peterborough, Ontario

DR. LITTLE has presented the problem confronting the medical officer of health in deciding what he will do about scarlet fever immunization. I agree with him that it is a formidable and costly undertaking causing inconvenience to parents and pupils, to say nothing of the discomfort to the latter following five inoculations and a Dick test. There is little difficulty in persuading parents to grant permission for immunization against diphtheria. Probably the

fear of this disease, and the fact that the administration of diphtheria toxoid is easy and comfortable, are responsible for its ready acceptance. The publicity which has been given to diphtheria toxoid is responsible in no small measure for the popularity of this procedure. It is regrettable that scarlet fever immunization receives so little attention. Scarlet fever may be quite as dangerous as diphtheria and yet the response to the medical officer's request to protect children from it is comparatively small. It seems queer, but apparently it is a fact, than an epidemic of scarlet fever is required to persuade parents of the value of active immunization. At least this is our experience. From personal experience with scarlet fever immunization I feel that we are justified in offering it with the same enthusiasm as diphtheria immunization. It does prevent scarlet fever.

The decision regarding the necessity of a preliminary Dick test naturally rests with the medical officer of health. When we started our immunizing campaign we Dick-tested 2419 school children. Seventy-one per cent. were Dick-positive. It was noted that the number of Dick-negative children increased with the age groups. Under 12 years of age 77 per cent. were positive, and over 12 years, 59 per cent. We felt at that time, and are still of the opinion, that preliminary Dick tests may be omitted in children under 12 but that over 12 a Dick test would exclude a number of Dick-negative children, materially reducing the number of inoculations. The performance of the test is not difficult. It may be the means of saving the operators time and will certainly be a boon to the children to whom the series of doses are just so many needle pricks.

Dr. Little has said that results show wide variation. This, unfortunately, is the case and his suggestion that a study of the situation be made by the Federal Government is excellent. On account of these varied results it is advisable to Dick-test all those who received the inoculations. In our series we tested all who had received three or more doses and of these, 91 per cent. were Dick-negative. Of more importance to us was the evident reduction in the number of reported cases following the inoculations. We began to feel the benefit almost at once. It was noted that the proportion of reported cases in children showed a decrease with a proportionate increase in adult cases. We cannot offer figures as conclusive as Dr. Little's but we did find that of 58 cases developing in school age children following the inoculations, 5 had received doses varying from one to five, and none had a final Dick test.

In conclusion may I say that it is our intention to offer this immunization procedure annually to school and pre-school age children. This in spite of all the handicaps of many doses and possible discomfort. I am sure that any health officer who has experienced an epidemic of scarlet fever even of a mild type will welcome any instrument, no matter how cumbersome it may be, that will rid him of this communicable disease. I join with Dr. Little in expressing the hope that before long we will have a product which, with fewer doses, will confer a reasonable immunity. It is also my hope that scarlet fever immunization will receive the same amount of publicity and support that is at present accorded diphtheria toxoid.

Population Estimates*

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THE general purposes of striking intercensal and postcensal estimates of population are so numerous and varied that there is nothing to be gained by a detailed description of them in a short paper. The question that concerns us is, why official estimates? For most purposes the decennial censuses furnish us with a sufficiently complete picture of population trends and any person who wishes can make his own intercensal estimate, since for his purposes a few thousands out one way or the other do not affect his problem. Furthermore, he may be just as close to the true figure at times as the official estimates, as he is under no responsibility to explain his methods and can change them according as he senses that population growth is speeding or slowing up at the moment. The official estimate differs from the individual estimate in that it has to provide a figure that can be used uniformly. Among its many difficulties is the fact that if the estimator is committed to a method he must use it no matter how much he feels or senses that something is happening for the time being that will upset all his calculations. He has to tell how he arrived at such a figure, and if this is done by a different method from that by which he obtained a previous figure he will be criticized.

The official estimate is intended almost solely for the purpose of striking per caput attributes. This must be kept clearly in mind. Another fact that must be kept in mind is that no estimate, however carefully and skilfully arrived at, is free from error and equally good all the time. We expect an error, we know there is an error, and all that we can do is to keep that error within reasonable limits. Above all we must endeavour to make this error casual; i.e., to ensure that it is as likely to be in one direction as the other. If we can ensure a reasonable limit of error and freedom from bias we do all that can possibly be expected. The estimate then in the long run gives true trends.

Since estimates are for caput rates, it is clear that the size of the error must be conceived in the light of a percentage. Thus if the true birth rate is, say, 24 per thousand, and the population estimate is 1 per cent. in error (say too small), then the birth rate shown as a result is 24.2 per thousand—hardly noticeable—but think of what a difference this makes according as the population estimated is large or small. An estimate of the United States population 1 per cent. in error would mean an error of more than a million and a quarter people; in the province of Prince Edward Island it would mean about 880 persons—a number sufficiently small to be transported over night. Consequently it is very much

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easier to estimate a large and well settled population than a small and widespread one. Old countries can use practically any method they choose and still have a reasonably small percentage error. A province with a rapidly moving population is practically impossible to estimate.

We have gone into the methods of estimating population in the various countries of the world and find very little that is worth recording in this paper. They call their methods by different names and you try to trace them to the figures they obtain but generally find that some subtle point or other is left out of their description. In other words, they are under the difficulties just mentioned when referring to the official estimator. They have to take certain liberties with their own methods and they cannot be too definite in describing them. Australia is quite definite. There immigration, emigration, natural increase and interstate migration (except by road) are ascertained and integrated. Even then there is a margin of error. However, judging from our experience we believe this is the only method of estimating population. Estimating from trends and curves is popular, but it is simply no good. We have experimented with trends in Canada and find that it works sometimes and sometimes not. Before 1931 we had actually succeeded in working up a beautiful method by means of a multiple correlation which seemed fool-proof. Before using the results we decided to wait until the 1931 Census. The closeness to the figures of the Census was astonishing. Certain facts were coming out in these unofficial estimates that would have created a great deal of comment had we published them instead of the trend figures we were actually using; e.g., one province was showing a declining population that never showed it before. But there was one serious difficulty: the element that carried by far the greatest weight was migration and that suddenly stopped or almost stopped. The method was not usable even for one year after the Census. We had a still more unsatisfactory experience with mathematical trends. At the present moment there is little doubt that a Pearl and Reid curve from 1901 or 1911 would give us a close estimate for Canada as a whole, but a sudden change would upset that in a year. Even if we knew that the sudden change had taken place we could not change the method without encountering all sorts of questions and objections, and then we would not know where we were.

Our actual method of estimating the population of Canada may be described as follows:

1. First of all we take Canada as a whole. We know the population at the Census of 1931. We have the yearly natural increase, the number of immigrant arrivals and the number of emigrants to the United Kingdom and the United States. We have also circularized all the principal countries of the world for the number of yearly immigrant arrivals from Canada and while the replies have not been very satisfactory they give us some indication of the volume of emigration to foreign countries. Generally, it may be assumed that the emigration to these countries bears the same proportion to the immigrant population from these countries as the emigration from the United States and United Kingdom bears to the immigrant population from these two countries. The integration of natural

increase and immigration less emigration is taken as our net increase in population for the year. This is added to the previous year's population. If we could carry out this plan without a hitch there is little doubt that our estimate for all Canada for any year would be a close percentage in spite of certain unknowns such as the full amount of emigration to foreign countries, but there is one serious drawback; we had to estimate the population of, say, 1938 in 1938, but the figures on which we base the year's increase will not be available till about September, 1939. If we could wait until 1939 to make the 1938 estimate we would be in a much more satisfactory position but we were not permitted to wait. Consequently we had to do some predicting. However, when 1938 figures finally come in, we correct the 1938 estimates accordingly for, above all, we must avoid accumulating errors. The estimate of the increase up to June 1, 1939, will be added to this corrected figure, not to the published figure for 1938. This gets us into some trouble for we are being continually called upon to explain why only such and such an increase was shown during the year. Consistency is well enough but it is obviously better to be inconsistent as between two successive years than to allow an error to accumulate.

The estimate for the different provinces is far more difficult than that for the Dominion, and the per cent. error is apt to be much greater. We know the province of destination of the immigrants and we have the natural increase by provinces. We apportion the total emigration to the different provinces, according to the number of persons of the country of birth of these emigrants in the province. We thus apportion the grand total increase to the different provinces as a rough first approach. We then treat this rough approximation to a series of tests—birth, death, marriage and school attendance rates. It is true that at best these give us only rough results but one or the other of these rates is apt to give the game away if we are much too high or too low. Death rates particularly, when compared with that of 1931 and with the Dominion as a whole in the current year, change but not so rapidly that we can go very far afield. If without an unusual increase in epidemics our death rate jumps, we conclude either that our population estimate is too low or that something has happened that should be investigated. This sometimes does not help us much. For example, we found that the death rate of British Columbia was growing too fast and concluded that our estimate for that province was too low but on investigation we found that the increase in deaths was entirely among persons over fifty years of age; the other ages decreased. We still believe that the British Columbia estimate is somewhat low but we cannot believe that the increase in population to bring down the total death rate near the 1931 level could take place among persons over 50 years of age. We make some allowance but cannot make all the allowance called for, after also allowing for the ageing of the population. Except for persons going into retirement, it is against experience that a moving population is recruited from persons over 50 years of age; rather is it largely from persons 18 to 40. If the deaths had increased between these ages we would have felt certain that we were underestimating the population, but as it is, we are not sure. However, we prune down or boost the original estimate by a certain amount to

preserve a degree of consistency with current facts such as these different rates. We cannot go very far in this direction without introducing a strong arbitrary element into our method but we take some liberty, and this we believe is justifiable.

From the difficulties besetting the simple estimates of total populations, it is clear that it would be very unwise to attempt more ambitious projects, such as apportioning these populations by age or sex, and still more unwise to attempt predictions of future populations. Calculations can be made in this direction that may serve certain purposes. Thus, by means of life tables and current birth and death rates, we may calculate a future population, provided these rates continue. Surely, making such a calculation would not be for purposes of prediction but rather to show us present tendencies; in other words, it would be merely stock-taking. But it would be poor policy to make such calculations official as the public would be certain to take them as predictions.

Conclusions on population trends since 1931 on the basis of an estimate would obviously be largely a begging of the question. It is hoped that it has already been made clear that this is not the purpose of the estimates. However, a few points might be mentioned as revealed not by the absolute figures of the estimates but rather by the elements that either enter into their make-up or are used as checks. It is difficult to believe that the population of Canada can have grown more during the last eight years than the estimates show, and, if this is so, there has evidently been a considerable slowing up as compared with the first three decades of the century. But a similar phenomenon was shown in the Prairie Provinces between 1921 and 1926, so that we cannot stress this point too much. Again, there seems to be evidence that some of the decreasing or near-stationary provinces are probably gaining, unless we suppose an improbable rise in birth rates. If this is so, it is easily understandable. In our studies on population by small areas since their settlement we found them one by one growing more or less rapidly and then coming to a maximum. This maximum was obviously possible only through migration since natural increase would still be going on. Many or most of these, once the maximum was passed, continued to decrease as the rest of the country increased, but made some gains when the rest of the country slowed up. This was obviously because part of the population moved away during periods of general activity and remained at home in periods of inactivity. The tendency therefore of a period of inactivity such as we have recently passed through would seem to bring about a more evenly spread population, while that of a period of unusual activity is to collect the population in spots. A study of the population growth in these small parts probably gives better hints than any other means as to the probable movements of population between provinces and between rural and urban and, while it would not be good policy to put these hints in official figures, they serve for purposes of enlightenment.

An Outbreak of Acute Anterior Poliomyelitis in Alberta during the Winter Season

A. C. McGUGAN, M.D.
Director, Division of Communicable Diseases
Department of Public Health of Alberta, Edmonton

IN November and December of 1938 and January of 1939 eight cases of poliomyelitis were reported from the Valley View district in the south-eastern section of the Peace River area. Valley View is a hamlet in a homestead district some fifty miles from the nearest railroad or telegraph communication and some thirty miles from the nearest telephone.

A district nurse provides the local emergent medical services. To her is due the credit for the recognition of the first cases of poliomyelitis and for the control of the outbreak.

Prior to 1938 there were remarkably few cases of poliomyelitis in the Peace River District. In 1938 several sporadic cases were reported from that area. In our experience a few sporadic cases in a district in one year are usually the forerunners of a severe epidemic in the same area in the following year.

In the Valley View district four cases were reported from an area three miles south of the hamlet. Four additional cases were discovered in a school district three miles north of the hamlet.

The incidence of poliomyelitis after the first of November has been very low in this Province. The fact that the months of November, December and January were unusually warm may have had some bearing on this outbreak.

Case 1

A young man of twenty-five was the first to report ill. He had not been away from the Valley View district for over a month before the onset of the acute stage of his illness. He came home from his trap line on the seventh of December because he was ill. In giving the history of his illness he stated that at the onset he felt as if he had a severe cold. He had generalized aches and pains. The pains were most severe in the legs and in the lumbar region. On the thirty-first of December he called the district nurse because he could not use his left leg. The nurse stated that at that time he had "scattered paralysis" in both legs. He was transferred to the orthopaedic section of the University Hospital, Edmonton, on the eighteenth of January. On admission his disabilities as shown on the hospital chart were as indicated in table I.

This patient's condition has shown some improvement.

TABLE I

EXTENT OF MUSCULAR INVOLVEMENT IN EIGHT PATIENTS
(Condition as reported March 1939)

LEFT SIDE OF BODY									RIGHT SIDE OF BODY							
Patient No.									Patient No.							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
									HIP								
	NN	N	F	N	N		N	N	Gluteus Maximus	N	P	F	N	F		N	N
	NN	N	F	N	N		N	N	Gluteus Medius	N	P	F	N	F		N	N
	N	N	F	N	N		N	N	Ilio Psoas	NN	P	F	N	P		N	N
	NN	N	F	N	N		N	N	Abductors	N	P	F	N	P		N	N
			F	N	N		N	N	Adductors	N	P	F	N	P		N	N
									KNEE								
	P	N	N	N	N		N	N	Quadriceps	N	P	P	P	N		N	N
	F	N	F	N	N		N	N	Hamstrings	N	P	F	N	N		N	N
									ANKLE								
	F	N	N	N	N		F	P	Gastrocnemius	N	P	F	N	P		N	P
	P	N	N	F	N		P	P	Tibialis Anterior	N	P	F	N	P		N	P
	P	N	N	N	N		P	P	Tibialis Posterior	N	P	F	N	P		N	P
	P	N	N	N	N		P	P	Peroneals	N	P	F	N	P		N	P
	P	N	N	N	N		F	P	Ex. Longus Digit	N	P	F	N	F		N	P
	P	N	N	N	N		F	P	Ex. Longus Hallicus	N	P	F	N	F		N	P
									TOES								
	F	N	N	N	N		N	N	Dorsi-flexors	N	P	F	N	N		N	N
	N	N	N	N	N		N	N	Plantar-flexors	N	P	F	N	N		N	N
									BACK								
	N	F	F	N	N		N	N	Erector Spinae	N	F	F	N	N		N	N
	N	F	F	N	N		N	N	Rhomboids	N	F	F	N	N		N	N
	N	N	N	N	N		N	N	Latissimus Dorsi	N	N	N	N	N		N	N
									NECK								
									ABDOMEN								
	N	N	F	N	N		N	N	Rectus Abdominus	N	F	F	N	N		N	N
	N	N	F	N	N		N	N	Abdominus Obliquus	N	F	F	N	N		N	N

TABLE 1 (continued)

LEFT SIDE OF BODY									RIGHT SIDE OF BODY							
Patient No.									Patient No.							
1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
								CHEST AND SHOULDER								
N	N	N	N	N		N	N	Intercostals	N	N	N	N	N		N	N
N	N	N	F	N		N	N	Deltoid	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Trapezius	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Serratus Magnus	N	N	NN	N	N		N	N
N	N	N	N	N		N	N	Pectoralis Major	N	N	NN	N	N		N	N
N	N	N	N	N		N	N	Int. Rotators	N	N	NN	N	N		N	N
N	N	N	N	N		N	N	Ext. Rotators	N	N	NN	N	N		N	N
								ELBOW								
N	N	N	N	N		N	N	Biceps	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Triceps	N	N	NN	N	N		N	N
N	N	N	N	N		N	N	Supinator Brevis	N	N	NN	N	N		N	N
N	N	N	N	N		N	N	Pronators	N	N	NN	N	N		N	N
								WRIST								
N	N	N	N	N		N	N	Flexors	N	N	N	N			N	N
N	N	N	N	N		N	N	Extensors	N	N	N	N			N	N
								FINGERS								
N	N	N	N	N		N	N	Flexors	N	N	N	N			N	N
N	N	N	N	N		N	N	Extensors	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Lumbricales	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Interossei	N	N	N	N	N		N	N
								THUMB								
N	N	N	N	N		N	N	Opponens Pollicus	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Flexors	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Extensors	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Abductors	N	N	N	N	N		N	N
N	N	N	N	N		N	N	Adductors	N	N	N	N	N		N	N

LEGEND

"N" = Normal—can overcome a resistance greater than "NN".
"NN" = Nearly Normal—can function against gravity and resistance.
"F" = Fair—functions against gravity but not against slight counter force.
"P" = Poor—can function slightly but not against gravity.
Case No. 6—No residual paralysis.

Case 2

The patient, a girl of eighteen, was employed in her father's restaurant at Valley View. Early in January, she consulted the district nurse and complained of generalized aches and pains. She complained particularly of pain in the back of her neck and in the calf muscles of the right leg. She did not have any elevation of temperature at any time. Tendon reflexes, right patellar and Achilles, were diminished at this time.

When the writer examined this patient on the twenty-seventh of January, her chief complaint was of pain in the right knee, ankle and hip joints. Deep tendon responses, right patellar and Achilles, were not elicited. There was marked loss of sensation. The patient could not differentiate between sharp and dull sensations in her right foot. Disabilities were as shown in table 1. She was transferred to the orthopaedic section of the University Hospital on the eleventh of February and is making an excellent recovery.

Case 3

This patient, a girl of seventeen, attended several public functions at which case 2 was present. These functions were held from the twentieth to the twenty-fifth of December.

Early in January she became acutely ill. She complained of generalized aches and pains and particularly of stiffness and pain in the back of her neck. She also complained of pain in the calf muscles and in her right ankle. Light was so annoying to her that it was necessary to darken her room when she was not wearing coloured glasses. For three or four days her temperature was from 103-104°F.

When the writer examined her on the twenty-eighth of January there was no evidence of paralysis. Both deep and superficial reflexes were present and equal. The patient's chief complaint was of severe pain in the right hip, knee and ankle joints.

About the middle of February the patient began to evidence muscle weakness which rapidly became worse. She was brought to the University Hospital on March the sixth, when her condition was as indicated in table 1.

Case 4

This patient, a woman of twenty-one years, became ill early in January at the same time as cases 2 and 3. Her onset symptoms were the same as in the other cases.

When the writer examined her on the twenty-seventh of January, there was slight weakness evident in the left deltoid and in the left tibialis anterior muscles.

At present she appears to have made a complete recovery.

CASES 5, 6, 7, and 8

These cases were discovered in an area about three miles south of the hamlet of Valley View. They were not reported during the acute stage. All were

discovered by the district nurse in an examination of the school children in this district.

Case 5

This child, a girl of thirteen, was dragging her right leg when the district nurse visited the school late in December, 1938.

The patient stated that towards the end of November she was confined to bed for three or four days because of a severe headache, pain in the right calf muscles and pain in the back of the neck. When she tried to walk, she fell. In the course of two or three weeks she partially regained the use of her right leg and returned to school. When she was examined on the twenty-fifth of January, her disabilities were as charted in table 1. She complained of pain in her right knee.

Case 6

This patient, a nine-year-old girl, was ill at the same time as her sister (case 5). Her onset symptoms were the same as those of her sister. When examined, there was no evidence of residual paralysis.

Case 7

This patient, a seven-year-old girl, recalled having had pains in the legs in November, 1938. Neither she nor her parents could give any further information regarding the acute stage of her illness. When examined in January, she dragged her left leg. Muscle weakness is charted in table 1.

Case 8

This patient, a boy of twelve, also became ill about the tenth of November. Neither he nor his parents could give any information regarding the acute stage of his illness. After remaining in bed for four days, he tried to walk but could not do so. In the course of two or three weeks he could get about and was allowed to return to school.

When he was examined in January, there was evidence of weakness in both legs. The patient walked on his heels with a peculiar clumsy gait. The deformity in both feet was reminiscent of that usually described as talipes cavus. He complained of pain in his left knee-joint.

SUMMARY

Eight cases of acute anterior poliomyelitis have been reviewed. Four cases had their onset in November, 1938, and four cases occurred in January, 1939. The incidence of joint involvement in these cases was unusually high.

EDITORIAL SECTION

CONTROLLING DIPHTHERIA

THE article by Dr. D. T. Fraser reviewing the knowledge of diphtheria toxoid will be greatly valued by all who are concerned with the conduct of immunization against diphtheria in Canada. That diphtheria can be prevented is an established fact. The introduction of diphtheria toxoid by Ramon in 1923 made possible one of the greatest advances in preventive medicine. In Canada the use of diphtheria toxoid, prepared and used in accordance with Ramon's method, has afforded a volume of experience second only to that available in France. Following its introduction in Canada in 1925, the provincial departments of health quickly undertook its use and within a few years there was ample evidence of its value. The statistical studies of McKinnon and Ross (1931-35), using Toronto data, established beyond question the effectiveness of three doses of diphtheria toxoid in the prevention of diphtheria. During the intervening years this experience has been greatly extended, and confirmation of the value of this product has been supplied by the statistical returns from all parts of Canada.

The value of the administration of diphtheria toxoid in three doses has been stressed by Ramon; and in France, as in Canada, the three-dose method has been followed. The demonstration, in the laboratory, of the increased effectiveness of diphtheria toxoid when precipitated with alum, naturally led to the use of this product in human immunization. Optimistic trial of alum-precipitated diphtheria toxoid, given in one dose, was later followed by the demonstration that the measure of protection conferred was not sufficient. The administration of alum-precipitated toxoid in two doses is now being thoroughly studied. Observations are being made on large groups of the population in the United States, and to some extent in England.

Of greater importance than the type of diphtheria toxoid used is the interval of time between the doses. Interesting studies, to which Dr. Fraser has referred in his review, indicate the importance of the time interval. It is possible that two doses of diphtheria toxoid without alum, when given with an interval of six to eight weeks, may produce as satisfactory an immunity as that conferred by three doses given at a shorter interval. The importance of the fact that there

is a gradual loss of immunity induced by diphtheria toxoid is now recognized. Children should receive a reinforcing dose of diphtheria toxoid when entering school.

These aspects of the subject of immunization with diphtheria toxoid are important. The urgent matter, however, is the utilization of our knowledge to control diphtheria in Canada. In certain cities and towns, and in some rural areas, diphtheria-toxoid immunization is being practised in an effective manner. Health departments and physicians see that infants, as soon as they have passed six months of age, are given the protective treatment, and every effort is made to ensure that all of the preschool group are immunized. The number of communities in which the diphtheria-immunization program is carried on in a systematic and effective manner is, unfortunately, small. In many communities the work is conducted spasmodically. In too many it is confined to school children. In a very large number of communities no immunization program is conducted. If there is one lesson to be learned from the experience of the past decade in regard to diphtheria, it is that continuous and effective immunization is the only means of preventing diphtheria deaths in any community. In the face of the mobilization of all our resources, there is no excuse for any municipality to permit of the ravages of diphtheria. The provincial health departments stand ready to supply diphtheria toxoid. It rests with the medical officer of health of each municipality, and with the physicians, whether or not the community is to be afforded the protection which is its right.

THE LETTER FROM GREAT BRITAIN

THE absence of the quarterly Letter from Great Britain will be noted with great regret by the readers of the JOURNAL. During the past seven years Dr. George F. Buchan, F.R.C.P., D.P.H., Medical Officer of Health of the Borough of Willesden, London, has presented a review of developments in public health. Each letter has reflected the careful selection of material of interest and practical value to health officers, not forgetting the interests of public health nurses and sanitary officers also. The letters have been most informative and have enabled Canadian public health workers to learn of the significance of recent legislation in public health and social medicine. Dr. Buchan, we believe, knows full well the interest and appreciation with which his communications have been received. To him the JOURNAL again expresses its sincere thanks. As expressed in Dr. Buchan's letter to the Editorial Board, it is hoped that it may not be long before it will be possible to resume these communications.

REPORT OF THE ASSOCIATION'S WORK DURING 1938-39*

(Part V)

REPORTS OF THE COMMITTEES OF THE LABORATORY SECTION

ON the occasion of the annual meeting of the Association held in Halifax in June the Laboratory Section co-operated with the program committee in contributing several papers. No meetings of any Section were held during this annual meeting. Consequently the Christmas meeting of the Section, held in the Royal York Hotel, Toronto, on December 19th to 21st, was of special importance. From every standpoint the meeting was most successful. The registration, one hundred and forty-five, was the highest yet recorded. Those attending the meeting included, among others, representatives of the Ministry of Health of Quebec and of almost all the provincial departments of health; the University of British Columbia, the University of Alberta, the University of Western Ontario, the University of Toronto, Queen's University, McGill University, the University of Montreal, Dalhousie University; the Laboratory of Hygiene of the Department of Pensions and National Health; the Dominion Department of Agriculture; the Animal Diseases Research Institute; the Banting Institute, University of Toronto; the Connaught Laboratories and School of Hygiene, University of Toronto; the Institute of Public Health, London; the Ontario Agricultural College and the Ontario Veterinary College, Guelph. The Section was honoured in having as its guest speaker Dr. John E. Gordon, Professor of Hygiene and Preventive Medicine in Harvard University, who gave a summary of his studies in scarlet fever. The meeting was the occasion also for a gathering of bacteriologists interested in milk and water and a committee was appointed to consider the formation of a sub-section of those interested in these fields. The importance of the meeting in affording an opportunity for the presentation of studies in universities and various public health laboratories was indicated by the fact that thirty-two papers were presented. Abstracts were published in the January issue of the Journal, occupying thirty-five pages. The Christmas meeting is now established as the occasion for the gathering together of laboratory workers from all parts of Canada for the discussion of recent advances in all the fields of their endeavours.

The reports of the various committees of the section indicate the progress that has been made during the past year. The Committee on Standard Methods was reorganized so that various subcommittees might be correlated more effectively. Dr. A. E. Berry was elected chairman of the Committee.

RONALD HARE, *Secretary.*

REPORT OF THE COMMITTEE ON THE BACTERIOLOGICAL AND CHEMICAL ANALYSIS OF MILK

THE members of the committee for 1937-38 were as follows: Dr. A. J. Slack, London; Professor H. R. Thornton, Edmonton; Mr. M. H. McCrady, Montreal; Dr. A. E. Berry, Toronto; Dr. C. E. Dolman, Vancouver; and Dr. J. M. Rosell, St. Hyacinthe, Que. Owing to the widespread distribution of the committee membership, it was impossible to convene all the members at one time and place. Your chairman, however, communicated with each.

Practically all the members considered it more or less obligatory to await the publication of the new Standard Methods for Milk Analysis before advocating the adoption of any new procedures or modification of those now existing. We are fortunate in having on our committee several members of the committee of the American Public Health Association, so that our studies are closely correlated with the work of American Public Health Association's committee.

Your committee believes that the coliform and phosphatase tests are likely to be adopted as routine procedures and, in the case of the latter, effort is being directed towards developing a satisfactory field test. As might be expected, the committee members as a whole regard adequate pasteurization as the most useful single procedure in the control of the milk supply. For control of the raw product, greatest reliance is placed upon the methylene blue, the catalase, and the direct microscopic count. The value of the plate count in bacteriological control will, in the opinion of this committee, necessarily await the outcome of the study now being made for the committee of the American Public Health Association on the optimum incubation temperature for, and final composition of, the agar medium.

Your committee hopes, when the new Standard Methods are published, that specific direction will thus be given to further work. In the meantime, it feels that definite progress has been achieved in collecting from all parts of Canada information concerning the present status of bacteriological and chemical testing of milk and the practical problems which confront workers in their own localities.

A. B. MOFFAT, *Chairman.*

REPORT OF THE COMMITTEE ON BACTERIOLOGICAL EXAMINATION OF WATER AND SEWAGE

THE activities of the committee have been limited, during the past year, to an attempt to enlist a number of Canadian laboratories in an effort to determine their experience of the simplified brilliant green bile confirmatory procedure for detection of the presence of coliform organisms in lactose broth presumptives.

This procedure may be described briefly as follows: Portions of the water or sewage sample are placed in lactose broth fermentation-tubes which are

then incubated at 37°C. in the usual manner. At the first appearance of gas, instead of confirming by means of the ordinary long, involved procedure (employing an endo or eosin-methylene-blue agar plate, secondary lactose, agar slant and gram stained microscopical preparation) a loopful of the lactose broth culture is transferred to a fermentation-tube containing brilliant green bile 2 per cent. special, which is incubated at 37°C. for 48 hours. If gas is formed in this tube, the presence of coliform organisms is considered to be confirmed. Should further confirmation be desired, the complete confirmation procedure may be applied to the bile culture.

In the Eighth Edition of Standard Methods of Water Analysis, gas in the confirmatory bile tube is considered to constitute sufficient confirmation of the presence of coliform organisms in all waters that are not used for human consumption. For waters employed for human consumption, however, the more complete confirmation, either of the lactose broth presumptive or of the gas-positive bile tube, is required. It is possible that further experience of the simpler confirmatory procedure may lead to extension of its application to certain types of the latter group of waters, such as private and other small supplies.

The great advantage claimed for the brilliant green bile confirmatory method is that it eliminates practically all the labour involved in complete confirmation of *false* lactose broth presumptives. Such false presumptives are encountered in the examination of many waters, particularly those that have been chlorinated.

During the years 1936 and 1937 a group of laboratories in Canada and the United States collaborated in a study of several different confirmation procedures, including that which employs brilliant-green bile. The results of this study (1) indicated that the bile method was the most generally satisfactory, that it compared very favourably with the usual Standard Methods completed test and, in the examination of most waters, might advantageously replace it; and that, in the examination of finished waters, its use followed by complete confirmation gave quite as satisfactory results as did the direct complete confirmation of the lactose broth presumptives.

Since only provincial laboratories from two Canadian provinces participated in the first study, the committee considered it advisable to determine the experience of other Canadian laboratories with the simplified confirmatory method. Correspondence with a number of provincial and municipal laboratories has resulted in securing the co-operation of four of these laboratories, and the probable future co-operation of two other laboratories. The committee believes that, in the course of the next few months, the information obtained will enable it to determine, in a general way, whether the bile confirmatory method may or may not advantageously be employed in the examination of Canadian waters.

Lessons from the 1935 Minneapolis Typhoid Fever Epidemic (2)

The committee desires to direct the attention of those interested in bacteriological control of water supplies to the new conception of the coliform density required to indicate dangerous pollution of a water suggested by the

Minneapolis typhoid epidemic of 1935. Heretofore it has been taken more or less for granted that, because of the disproportionately large number of coliform organisms, compared with the number of enteric disease organisms, ordinarily found in sewage, dangerous human pollution in a water supply could readily be detected by an examination, for coliform organisms, of a few 50-cc. samples of the water. In the Minneapolis outbreak, however, extending over a period of nearly 4 months, during which 214 cases of typhoid occurred, scattered throughout that portion of the city supplied by a certain filtration plant, coliform organisms were discovered in a maximum of only about 5 per cent. of the 50-cc. samples examined by the State Board of Health Laboratory in any short interval. In other words, if only 1 sample of 50 cc., or 5 portions of 10 cc. each, had been examined each day, coliform organisms would have been detected in only one 50-cc. portion in a period of three weeks. Yet this water, although it contained so few coliform organisms, was evidently continually infecting its consumer population.

The lesson here is obvious: adequate control of water supplies, particularly large supplies, may require a far more intensive search for coliform organisms in the water than has hitherto commonly been practised. Samples of 50 cc. and even of 100 cc. of the water may have to be collected and examined in such number that the presence of coliforms in at least a few per cent. of them may readily be detected. It is true that a number of purification-plant laboratories are at present examining 50-cc. or 100-cc. samples, but very probably the number of such samples tested each day is rarely sufficient to detect pollution of the character that caused the Minneapolis epidemic.

Another point of interest in the Minneapolis outbreak is the evident persistence both of *B. typhosus* and of coliform organisms in water containing from 0.1 to 0.7 p.p.m. of residual chlorine. Only when the residual was maintained, for a long period, at over 0.3 p.p.m. throughout the distribution system, was the epidemic finally brought to an end. The lesson here is either that some strains of *B. typhosus* and coliform organisms are extremely resistant to high chlorine residuals, or that "chlorine residuals", as ordinarily determined, even in the absence of the recognized interfering substances such as nitrites, etc., do not necessarily represent available *bactericidal* chlorine residuals. Very probably particularly resistant enteric disease as well as coliform organisms do exist, and very probably, too, so-called chlorine residuals do not, at times, represent available bactericidal residuals. The plant operator, evidently, should not place too great reliance for safety upon the chlorine residual found in a finished water, but depend rather upon the results of an intensive search for the presence of coliform and perhaps other organisms that indicate dangerous pollution.

N. J. HOWARD A. G. LOCHHEAD M. H. MCCRADY, *Chairman*

REFERENCES

(1) McCrady, M. H.: A. J. Pub. Health, 27, 1243.
(2) Minnesota Dept. of Health, Report of Investigations of the Typhoid Fever Epidemic, Minneapolis, 1935.

REPORT OF THE COMMITTEE ON SWIMMING POOLS

IN May 1938 the committee was reconstituted, with the following personnel: Dr. A. E. Berry, Dr. K. F. Brandon, Mr. René Cyr, Mr. G. H. Ferguson, Mr. J. R. Menzies, Dr. John Wyllie, and Mr. R. F. Heath, chairman.

At a later meeting the committee was asked by members of the executive of the Association to devise laboratory standards for the control of sanitary conditions in swimming pool waters.

Standards applicable to pool waters fall into three divisions: bacterial, chemical and physical, and for the time being the committee is concentrating its efforts on the first named, i.e., the formulation of a standard of bacterial quality.

As a working basis the recommendations of the Joint Committee on Bathing Places of the Conference of State Sanitary Engineers and the American Public Health Association for the year 1937 were adopted.

With reference to bacterial quality the American Public Health Association report makes the following recommendations, which for the purpose of this report are given in an abridged form below:

(1) *Bacteria count on standard nutrient agar—24 hours—37°C.—and confirmed test.*

"Not more than 15 per cent. of the samples covering any considerable period of time shall contain more than 200 bacteria per ml. or shall show positive test (confirmed test) in any of five 10.0 ml. portions of the water at times when the pool is in use. . . .

(2) . . ."In order to secure a true picture of the conditions of swimming pool water at the time of sampling, it is recommended that sodium thiosulphate be employed to neutralize the chlorine residual in the water sample bottle during transportation to the laboratory.

(3) . . ."The committee calls attention to the fact that streptococci tests are of value in passing on the condition of swimming pool waters but does not recommend any uniform standard limit for their presence."

With reference to the standard plate count and the incidence of coliform bacteria a survey of all the provinces in Canada has been made and, with the exception of Saskatchewan, a good deal of valuable information and expressions of opinion have been received through the committee members representing the various provinces. The opinions vary to some extent, more particularly with respect to the applicability of the American Public Health Association standard under existing conditions of pool design, equipment and operation, and your committee would suggest that further studies directed to this point be carried on during the coming year.

The use of sodium thiosulphate treated bottles for the collection of swimming pool water samples under certain conditions has been subjected to some criticism (see C. Ritter, J. Am. Water Works Assoc., vol. 29, no. 4), and one member of our committee is at present carrying out an investigation into this matter with a view to determining the desirability of using the treated bottle in all cases of sample collection.

A member of the committee is also investigating the use of streptococci tests in relation to their usefulness as a proposed standard in the evaluation of swimming pool waters.

Another member is collecting information regarding regulations now in force throughout the Dominion in order to determine what measure of control now exists.

During 1939, in addition to continuing the work already undertaken the committee is hopeful of extending its activities to cover a study of the physical and chemical requirements of swimming pool waters as a guide to establishing standards.

R. F. HEATH, *Chairman.*

REPORT OF THE COMMITTEE ON CHEMICAL WATER STANDARDS

THE committee under the chairmanship of H. A. Leverin now consists of the following members: A. Blackie, J. L. Bowlby, C. H. Bayley, A. R. Bonham, C. E. Dolman, A. V. DeLaporte, M. H. McCrady, W. E. Paterson, O. J. Walker, and A. F. Gill (secretary).

The following resolution has been adopted:

"That the Canadian Public Health Association and the Canadian Institute of Chemistry each pass a resolution whereby the Standard Methods for the Examination of Water and Sewage of the American Public Health Association and the American Water Works Association shall be declared as official for each organization. Furthermore, that the official method of reporting the results of chemical analyses of water and sewage shall be in parts per million using the ionic basis."

Other activities of the committee may be summarized as follows:

A paper entitled "The Determination of Small Amounts of Cyanide" which has been prepared by Mr. Fasken of Mr. Bonham's staff has been submitted to the Joint Editorial Board of the American Public Health Association and the American Water Works Association and it is expected that it will be published in the near future.

Work is going on under the direction of Messrs. Bonham and DeLaporte on the determination of iron by the use of ortho-phenanthroline monohydrate and thio-glycollic acid respectively. Results with the latter procedure have been favourable and it is planned to have co-operative tests made in the laboratories of the various committee members.

Arrangements have been made by Mr. DeLaporte for the investigation of a colorimetric method for the determination of alumina in the laboratories of the University of Toronto and it is believed that a considerable amount of work is being done.

The committee has given some consideration to the matter of classification of water but it is believed that any work in this field must be undertaken with a great deal of caution.

Some work has been done and consideration is still being given to the palmitate method for the determination of soap hardness.

The committee recommends that its name be recorded as the "Committee on Chemical Water Standards".

H. A. LEVERIN, *Chairman.*

REPORT OF THE COMMITTEE ON EXAMINATION OF AIR

CONTROL of the purity of the atmosphere offers many difficulties. Before such control can be exercised it is necessary to know the amounts of contaminants present and also what concentrations of the substances possess significance from the standpoint of health.

The problem of atmospheric pollution may be divided into two broad subdivisions. The first of these concerns the pollution of outside air with smoke and other products of combustion. The second deals with the contamination of the air within the confined spaces of factories or mines with a large variety of materials which find application in or arise from industrial processes.

The more general part of the problem, that of pollution of the air with combustion products, affects all inhabitants of urban communities. Research on this subject has been carried out in England, Continental Europe, Japan, the United States and Canada. Although it has been shown that smoke pollution involves a tremendous economic wastage, it has as yet been impossible to demonstrate conclusively that it exerts a deleterious effect on health. It is probably for this reason that efforts at control have been none too successful. In spite of the fact that rigid proof of harmful effects of smoke are at present lacking, there is a growing feeling among health authorities in many parts of the world that a more concerted effort should be made to bring about adequate control of the purity of the air.

The second phase of the problem affects a much smaller part of the population but is far more important, since the harmful effects of many materials which contaminate the air in industry have been clearly demonstrated. Concerning other substances, information is vague or entirely lacking. This whole problem is part of a specialized branch of public health administration and in most communities with a large industrial development, departments of industrial hygiene have been established with facilities for assessing the hazards involved in industrial processes.

In a report of this kind it will be possible to touch only briefly on some of the more important aspects of this problem.

Classification of air contaminants of industrial origin is usually based on the physical state of the materials in question. Four broad categories are generally recognized which are as follows:

1. Dusts: Finely divided particulate matter.
2. Fumes: Result usually from the sublimation of molten metal and are in reality dusts in a very fine state of subdivision.
3. Vapours: Arise from the volatilization of materials which have an appreciable vapour pressure at the temperature at which they are used.
4. Gases: Materials occurring entirely in the vapour state and result usually as products of combustion or chemical reaction.

Dusts

This form of air contaminant is certainly the most important both from the standpoint of number of people affected and the cost of the disability produced. Quartz, asbestos, and lead are the principal materials which fall into this category.

Finely divided silica arises in Canada mainly as a result of mining operations. Other important sources of exposure are foundries where sand blasting is being carried out or among stone cutters where rock containing a high percentage of silica is being processed. It is generally conceded that only silica dust, lying within the narrow limits of size of from 0.5 to 5 microns is of physiological importance and that exposures to concentrations less than $5X10^6$ particles per cubic foot of air are probably not dangerous. Determination of the amount of silica in an atmosphere is usually carried out by means of an impinger apparatus in which dust from a known volume of air is trapped in water and microscopic counts of the number of particles present are made. Determination of the amount of dust that is free silica is often more difficult and is usually accomplished by chemical analysis of the rock which is being processed. The allowable concentration of dust in the air varies inversely as the amount of free silica that is present.

Lead, the second most important air contaminant of this class, results from a wide variety of industrial processes. For collection of this material from the atmosphere the impinger is again usually used, and the amount of lead that was present determined by chemical means. The maximum allowable concentration of lead in an atmosphere is about 0.15 mg. per cubic metre of air.

In addition to these two important dusts there are a variety of dusts of organic origin, which in sensitive individuals produce allergic reactions. Each of these present an individual problem and no upper limit of concentration for these materials can be set.

Fumes

Contaminants of this class usually arise from processes where molten metal is being utilized. The methods used for determining the amounts present in the atmosphere are similar to that used for lead, except of course that with different materials different methods of chemical analysis are used. The most important members of this class are lead, zinc and cadmium.

Vapours

A large number of materials possessing widely varying toxic properties fall into this classification. Only a few of the more important will be mentioned. It should be pointed out that with both vapours and gases there are two types of exposure to be considered, short exposures to high rapidly toxic concentrations, and prolonged exposures to concentrations that produce no immediate effect. The first type of exposure is relatively unimportant from the standpoint of hygiene, since it arises usually as the result of an accident. Control of this type of hazard, therefore, is one of accident prevention. For this reason knowledge of the concentration necessary to produce acute effects is of little value except when one is dealing with very toxic materials, where this concentration is very low. Of more importance is a knowledge of the concentration of vapour that is dangerous for prolonged exposure. With a few substances such as benzol, carbon tetrachloride and other chlorinated hydrocarbons this limit can be set with some degree of certainty but with the

majority of materials our knowledge is meagre or entirely lacking. All materials that are volatile should be looked up on as potentially hazardous and concentrations in the air kept as low as possible until such time as more specific information is available.

Gases

The most important members of this group are carbon monoxide, chlorine ammonia and acid fumes of various kinds.

It has never been proved that these materials produce cumulative poisoning following prolonged exposures to concentrations which result in no apparent immediate effects. On the other hand the toxic concentrations for acute exposure are so low that precautions are necessary to prevent their occurrence.

In this report the committee has merely outlined the scope of the problem. Facilities for carrying out industrial air analysis are available in the Division of Industrial Hygiene of the Ontario Department of Health along with the available information regarding industrial toxic materials. Much more research is necessary before absolute standards of purity for industrial atmospheres can be set and then constant vigilance is essential to ensure their maintenance.

Regarding the question of atmospheric pollution by smoke, considerable work has been carried out at the School of Hygiene. It has been well established that smoke pollution in Toronto is sufficient to warrant a concerted effort being made to bring about an improvement in the condition.

H. M. BARRETT, *Chairman.*

REPORT OF THE COMMITTEE ON DIAGNOSTIC OUTFITS

THE committee recommends the following procedure for use in submitting to provincial laboratories material for the culture of ringworm:

Black paper is cut in four-inch squares. These pieces are folded in the same manner as one would fold a medicinal powder. The black paper wrapping of photographic films may be used. These folded papers are then placed in a cardboard box and sterilized.

To obtain infective material, the infected area should be sponged with 70 per cent. alcohol and allowed to dry. With a dull scalpel, scrapings are obtained from the lesion and placed in one of the sterilized black papers. As much material as possible should be obtained. If the region is hairy, broken stumps and roots of hairs should be collected. Clippings of nails or any other material of a dry nature may be placed in these papers. If the lesion is weeping freely or there is free pus present, a glass tube with stopper should be used to collect the material.

W. B. MCCLURE, *Chairman.*

REPORT OF THE COMMITTEE ON THE CLASSIFICATION OF SALMONELLA

FURTHER progress has been made in the classifying of cultures of Salmonella received from various parts of Canada. The committee records with pleasure the establishing in the Connaught Laboratories, University of Toronto,

of a centre affiliated with the International Serum Centre in Copenhagen. Standard cultures and sera for use in classifying members of the Salmonella group have been received from the International Centre.

The committee has to date received 828 cultures and classified the majority of them. No new types have been established and most of the cultures have been identified as well-recognized members of this group. There has been a preponderance of paratyphoid beta strains and only two strains of paratyphoid alpha have been isolated. We have not encountered the wide variety of members of this group which have been isolated from similar infections in Great Britain and Europe.

It is the hope of the committee that diagnostic laboratories across Canada may be provided with standard suspensions and sera for the identification of members of this group.

We extend our thanks to all who co-operated by submitting cultures which made this investigation possible.

M. H. BROWN, *Chairman.*

REPORT OF THE COMMITTEE ON PUBLICATIONS

THE Committee on Publications has continued to act in an advisory capacity to the Editorial Board with regard to technical papers on laboratory subjects.

Following the custom of recent years abstracts from the thirty-one papers presented at the Christmas meeting of the Section were published in the January issue of the JOURNAL. In the next three issues of the JOURNAL five of the papers given at the Christmas meeting received publication in full.

Nothing of a controversial character has been submitted to the committee during the year and the uniformly high quality of the material received for publications has reduced the work of the committee to a minimum.

A. J. SLACK, *Chairman.*

REPORT OF THE COMMITTEE ON NEW LABORATORY PROCEDURES

THE fourth edition of the Bulletin of Laboratory Procedures issued at the Christmas meeting of the Laboratory Section in December 1938 included: *The Preservation of the V Form of B. typhosus*, *Cultivation of the Gonococcus*, and *The Determination of Cyanide in Water*. These articles were believed to offer valuable material of an established nature to the personnel responsible for the conduct of public health laboratories in Canada.

The committee is greatly indebted to those whose co-operation and contributions made possible this issue of the Bulletin.

F. O. WISHART, *Chairman.*

PLANS, PROGRAMS, AND PROGRESS

The Eighth Annual Christmas Meeting of the Laboratory Section

THE eighth annual Christmas meeting of the Laboratory Section will be held in the Royal York Hotel, Toronto, on Monday and Tuesday, December 18th and 19th.

There will be four general sessions, a program of demonstrations, and an evening meeting preceded by an informal dinner. Papers in the field of medical bacteriology will be given at the opening session on Monday morning. In the afternoon a series of demonstrations contributed by a number of research institutes and university departments in Canada will be presented in the School of Hygiene, University of Toronto. Of special interest this year will be the dinner on Monday evening, which is to be followed by a round-table discussion. Two sessions will be held on Tuesday morning, one in the field of medical bacteriology and the other of interest to those engaged in the bacteriology of milk, water, and soil. Papers of general interest will be given at the session on Tuesday afternoon.

It is urged that titles of papers to be presented be submitted not later than October 31st to the secretary of the Section, Dr. Ronald Hare, at the Association's office, 105 Bond St., Toronto. Particular attention is called to the facilities provided in the School of Hygiene for the demonstrations and it is hoped that many laboratories will be represented.

Extensive abstracts of the papers will be made available during the meeting and will be printed in the January issue of the Journal, thus assuring prompt publication of the studies reported.

The Work of the County Health Units of Quebec During 1938-39

The growth of rural full-time health services in the province of Quebec has been remarkable. There are now forty-one county health units covering most of the rural areas, and providing prenatal clinics, child welfare clinics, supervision of mothers and preschool children, control of communicable diseases, and a continuous program of public health education. Highlights of the activities of the units during the year ending June 30th were presented recently in a report by the Honourable J. H. A. Paquette, Minister of Health for the province. In the report Dr. Jean Gregoire, who has the immediate supervision of the units, stressed the excellent co-operation of the public. In speaking of this co-operation, Dr. Gregoire said that there were numerous instances of sacrifice on the part of parents to have their children receive the benefit of protection against diphtheria or to attend other health clinics. At the height of the haying, when all horses and hands are needed, many mothers have walked miles to the clinics with their children, in order that they might receive the protective treatments.

Particular attention is being given to the problem of tuberculosis. Through the travelling diagnostic clinics operating in each of the counties where full-time health units are functioning, 35,544 persons were examined for tuberculosis, including those who had been exposed to the disease, with the result that 1364 new cases were found. Thirteen hundred clinics were held. In addition to the large number examined in the clinics, 11,841 cases were examined at home. Comparative figures for the year 1937-38 show that 1016 clinics were held, 23,712 people were examined, 988 new cases were found, and the diagnosis was confirmed in 2187 cases already under treatment. Two thousand nine hundred and thirty-two persons were visited at home. Extensive laboratory work was carried out in each year.

During the year 1938-39, 5634 clinics were conducted in infant hygiene, providing for the examination

of 96,724 babies and 56,935 preschool children, as well as 118,052 babies visited at home. These figures represent an increase of approximately 250 clinics and large increases in the number of babies and preschool children examined in their homes as well as in clinics.

During the year 50,385 children received three doses of toxoid for the prevention of diphtheria. This is almost double the number of children who received the preventive treatment during 1937-38. The number of those vaccinated against smallpox was approximately the same, 24,958 having been vaccinated in the clinics during 1938-39. A smaller number of anti-typhoid inoculations were given—2417 inoculations completing the preventive treatment, in contrast to 6203 in 1937-38.

During 1938-39, 18,131 prenatal and 22,305 post-natal visits were made, a definite increase over the number made in the preceding year. A feature of the maternal hygiene work has been demonstrations in the homes, often with neighbours present. This year 5173 such demonstrations were given, in contrast with 4226 in 1937-38. In addition, 178 public demonstrations and 223 public lectures were given.

The county health units provide supervision of all school children. In the year just ended 158,229 children were examined. Of this number 30,902 were found normal and 95,964 were directed to their family doctors for treatment. In addition, 24,203 children were found to be in definitely improved health as compared with the findings of the examination made in the previous year. Over 7000 lectures were given, with more than 200,000 attending. In other aspects of school health work there was a marked increase in the number receiving the examinations or benefiting from the lectures.

Control of communicable disease is one of the major undertakings. In 1938-39 39,246 contacts and suspects were examined and 4910 cases were notified. In addition 6803 cases were found which had not been notified. In this work 9179 houses were visited and 7572 children were quarantined and prevented from attending school during the period.

The extent of the inspection and instruction regarding sanitation and the control of foods is evidenced by the fact that during 1938-39, 72,677 inspections were made. This compares with 61,565 in the preceding year.

Extensive use is made of the laboratory facilities provided by the Ministry of Health. During the year under review, 7565 water samples and 9232 milk samples were examined; 4818 cultures were examined for diphtheria and 892 examinations were made for typhoid.

Public health education is continuously carried on by the personnel of the health units. During the year 157,147 families were visited and 490,834 booklets were distributed. Moving picture films were shown on 388 occasions and 804 lectures were given, with approximately 80,000 persons attending. This represents also a very considerable increase over the previous year in the amount of work conducted in health education.

THE ALBERTA ASSOCIATION OF PUBLIC HEALTH WORKERS

AFTER an interval of four or five years, during which meetings were not held, the Alberta Association of Public Health Workers has been reorganized at the request of a number of interested members who felt that if the various public health organizations, both full-time and part-time, of the Province were to function with the greatest efficiency, those interested in public health activities should have an opportunity to meet periodically for an exchange of ideas. The president of the organization is Dr. A. C. McGugan, Director of the Division of Communicable Disease, Provincial Department of Health, Edmonton, and the secretary is Dr. W. H. Hill, Medical

Health Officer of Calgary. Under their direction arrangements were made for a meeting which was held at Red Deer and Sylvan Lake on September 2nd. The program was planned so that medical officers of health, public health nurses, and health inspectors might participate. The program conveners included Dr. L. A. MacLean, Medical Officer of Health of the Red Deer Health Unit, Miss Laura Allyn of the Red Deer Health Unit, and Mr. D. B. Menzies, Provincial Sanitary Engineer, Edmonton. The general sessions were held in the City Hall, Red Deer.

Following a short business meeting, sectional meetings were held from 10.30 to 12.15, after which Dr. R. M. Shaw, Associate Professor of Bacteriology in the University of Alberta, addressed the Association on "The Carrier Problem in Haemolytic Streptococcal Infections". The members then adjourned to the Sylvan Lake Hotel for a luncheon meeting at which Dr. Malcolm R. Bow, Deputy Minister of Health of the Province, was the speaker. Six papers were presented at the afternoon session, each being followed by a discussion period: "Some Phases of Community Sanitation", by Mr. D. B. Menzies, Provincial Sanitary Engineer; "Post-Graduate Courses in Nursing", Miss Elizabeth Sage, Reg.N., Public Health Nurse, Youngstown; "Undulant Fever", Dr. G. M. Little, Medical Officer of Health, Edmonton; "The Health Unit Staff as Health Educators", Dr. A. Somerville, Medical Health Officer of the Foothills Health Unit, High River; "Epidemiology of Scarlet Fever", Dr. W. H. Hill, Medical Health Officer of Calgary; and "The Part-time Medical Health Officer in a Public Health Program", by Dr. A. C. McGugan. Readers of the JOURNAL will look forward to the publication of a number of these papers in early issues.

THE ROYAL SANITARY INSTITUTE HEALTH CONGRESS, 1939

THE 1939 Health Congress of the Royal Sanitary Institute was held in Scarborough, England, from July 3 to 8. Some two thousand persons were present, including medical officers of health, nurses, sanitary inspectors, and laymen associated with various health committees. In addition, a very considerable overseas contingent attended.

Scarborough, "Queen of Watering Places", proved a most attractive convention town. It combines at once a site of exceptional beauty and a municipal administration which has developed the natural charms of the town to their maximum.

The Committee, under the presidency of the Earl of Harewood, had provided scientific sessions in the mornings only. In the afternoons, a variety of excursions and entertainments had been arranged. At noon on one of the days a luncheon was given in honour of the overseas delegates. Representatives from seventeen British Dominions or colonies and eleven foreign countries were present, imparting an international and empire colour to the scene.

The different sections of the Congress met, for the most part, once only. The sessions were planned for three hours and usually consisted of the chairman's address and two or three prepared papers. This allowed ample time for discussion which, at the sections attended by the writer, was extensive and often animated. Free discussion was, in fact, a feature of the meetings. To one who had thought that much of British public health was exemplary, the criticisms raised came as somewhat of a shock. Yesterday's reforms are today's commonplaces, apparently.

At the Section on Preventive Medicine, the subject, *The Reorientation of the Public Health Services*, was discussed chiefly with respect to the multiplicity of governmental and local bodies dealing with the public health. A division of opinion was evident. One group favoured a higher degree of central control with the reorganization of the country into administrative districts or regions. Another group urged the value of decentralization and particu-

larly stressed the advantages of the personal touch when small numbers are dealt with. To the outsider, the organization of British health services is bewildering in its complexity. Like nearly everything else in the British Isles, health services have grown, they have not been planned, and, as a result, it is quite possible that things are being done the hard way.

One session of the Congress was given over to a discussion of the Cancer Act, 1939. This Act authorizes local authorities to make provision for the diagnosis and treatment of cancer. The underlying idea is that early treatment of cancer should be available to the entire population regardless of location or ability to pay. The general idea of organization in the British Isles is the creation of a relatively few treatment centres at suitable places and the affilation with these treatment centres of a larger number of diagnostic centres. Problems of transportation enter into this type of organization. This is recognized and presumably the cost will be met from the public purse.

At the Section on Industrial Hygiene, one paper dealt with industrial morbidity. It was chiefly an analysis of the vast amount of morbidity data which have been collected by the British Post Office during more than a century. Some of this material has already been published and is of particular value in that the data extend over a longer period than elsewhere. The British Post Office now employs over a quarter of a million men and women.

To a Canadian, the session at which health insurance was discussed was perhaps the most interesting. There appears to be considerable dissatisfaction with the National Health Insurance Act as it stands, and criticism is freely voiced. But critics, one and all, want more rather than less of it. The representative of the British Medical Association summed up the official attitude in these words: "The medical profession is a warm supporter of national health insurance." This is to be interpreted as meaning that the principle of health insurance is approved; the present Act is considered by the medical profession as too limited in its scope. The main criticisms directed towards the present Act at the meeting may be enumerated as follows:

1. The multiplicity of approved societies providing cash benefits has produced an inequality of treatment which is hard to justify. Some societies find it possible to give only statutory benefits; others, more fortunate in their sickness experience, have been able to add dental and ophthalmic, and even extra cash benefits.
2. The exclusion of wives and dependents of insured persons from the medical benefits of the Act is generally held to be a serious fault.
3. Cash benefits are inadequate. There has been little change in this since the Act was passed twenty-seven years ago, and now the cash benefit is well below that provided by unemployment insurance or even unemployment assistance.

The medical profession came in for its share of criticism, particularly from representatives of labour. There is an opinion in some quarters in favour of state medicine and a medical civil service. This idea, however, did not appear to meet very marked support at the meeting.

Other sections of the Congress undoubtedly discussed matters of interest to Canadians, but the writer was unable to attend them on account of the recognized impossibility of being in two places at the same time.—*Frank G. Pedley, M.C., B.A., M.D., C.M., C.P.H., Dr. P.H., Assistant Professor, Public Health and Preventive Medicine, McGill University, Montreal.*

PHYSICIANS ENROLLED AT THE SCHOOL OF HYGIENE UNIVERSITY OF TORONTO

THE following physicians have enrolled in the course leading to the Diploma in Public Health at the School of Hygiene, University of Toronto: Dr W. I. Bent, Oxford, N.S.; Dr. H.

R. Bulmer, Quiriquire, Venezuela; Dr. R. Cadham, Winnipeg, Man.; Dr. P. E. Cartier, Drummondville, Que.; Dr. J. A. Chabot, Lac Megantic, Que.; Dr. P. Claveau, Ville Marie, Que.; Dr. F. Derome, Montreal, Que.; Dr. M. B. Donaldson, Edmonton, Alta.; Dr. E. L. Eagles, Kentville, N.S.; Dr. G. R. F. Elliot, Essondale, B.C.; Dr. J. A. Leroux, Vancouver, B.C.; Dr. L. Lynch, New Carlisle, Que.; Dr. M. F. McGavin, Toronto, Ont.; Dr. L. A. MacLean, Red Deer, Alta.; Dr. W. C. Mooney, Vancouver, B.C.; Dr. G. G. Simms, Kentville, N.S.; Dr. J. R. Wilkey, London, Ont.; and Dr. Reba Willets, Kelowna, B.C. Dr. A. C. McGugan of Edmonton has enrolled for the work of the second and third terms, beginning in January 1940.

APPOINTMENT OF THE HON. IAN MACKENZIE AS MINISTER OF PENSIONS AND NATIONAL HEALTH

THE advent of the war, with the necessity for a rearrangement of responsibilities in the Dominion Cabinet, brings to the Department of Pensions and National Health the Hon. Ian Mackenzie as Minister, succeeding Major the Hon. C. G. Power, who has become Postmaster General. As former Defence Minister, the Hon. Mr. Mackenzie will continue to have close contact with war veterans, in whose interests he has been active as a member of the Government and as a Cabinet Minister. The Hon. Mr. Mackenzie was born in Scotland and came to Canada in 1914, practising law in Vancouver. He received the degrees of M.A. and LL.B. from Edinburgh University. He served overseas in the first Great War and at its conclusion entered the British Columbia legislature. Having been a member of the Federal Government since 1930 and possessing an intimate knowledge of the problems facing Canada in the mobilization of all resources, the Hon. Mr. Mackenzie brings to the Department of Pensions and National Health an experience and knowledge which should be of value in the furtherance of public health.

PERSONALS

AT the recent 150th anniversary of the University of Kings College, Halifax, held on August 23rd, Miss E. Kathleen Russell, B.A., B.Paed., Director of the School of Nursing, University of Toronto, received the honorary degree of D.C.L., in recognition of her outstanding contribution to nursing education in Canada.

DR. J. M. HERSHEY, D.P.H., who was formerly in charge of the Peace River Health Unit with headquarters at Pouce Coupe, B.C., has been appointed director of the Kelowna Health Unit. Dr. R. J. Macdonald, D.P.H., has succeeded Dr. Hershey as director of the Peace River Unit.

DR. RAYMOND C. PARKER, a native of Newport, Nova Scotia, has been appointed to direct a laboratory for the study of filterable virus diseases which has been established by E. R. Squibb and Sons, New Brunswick, New Jersey. Dr. Parker was educated at Acadia University and at Yale. He was formerly biologist at the Rockefeller Institute for Medical Research and for many years an associate of Dr. Alexis Carrel.